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December 1998

# Terrestrial Invertebrates of Edwards Air Force Base, 1996

by *Gordon Pratt, University of California at Riverside*

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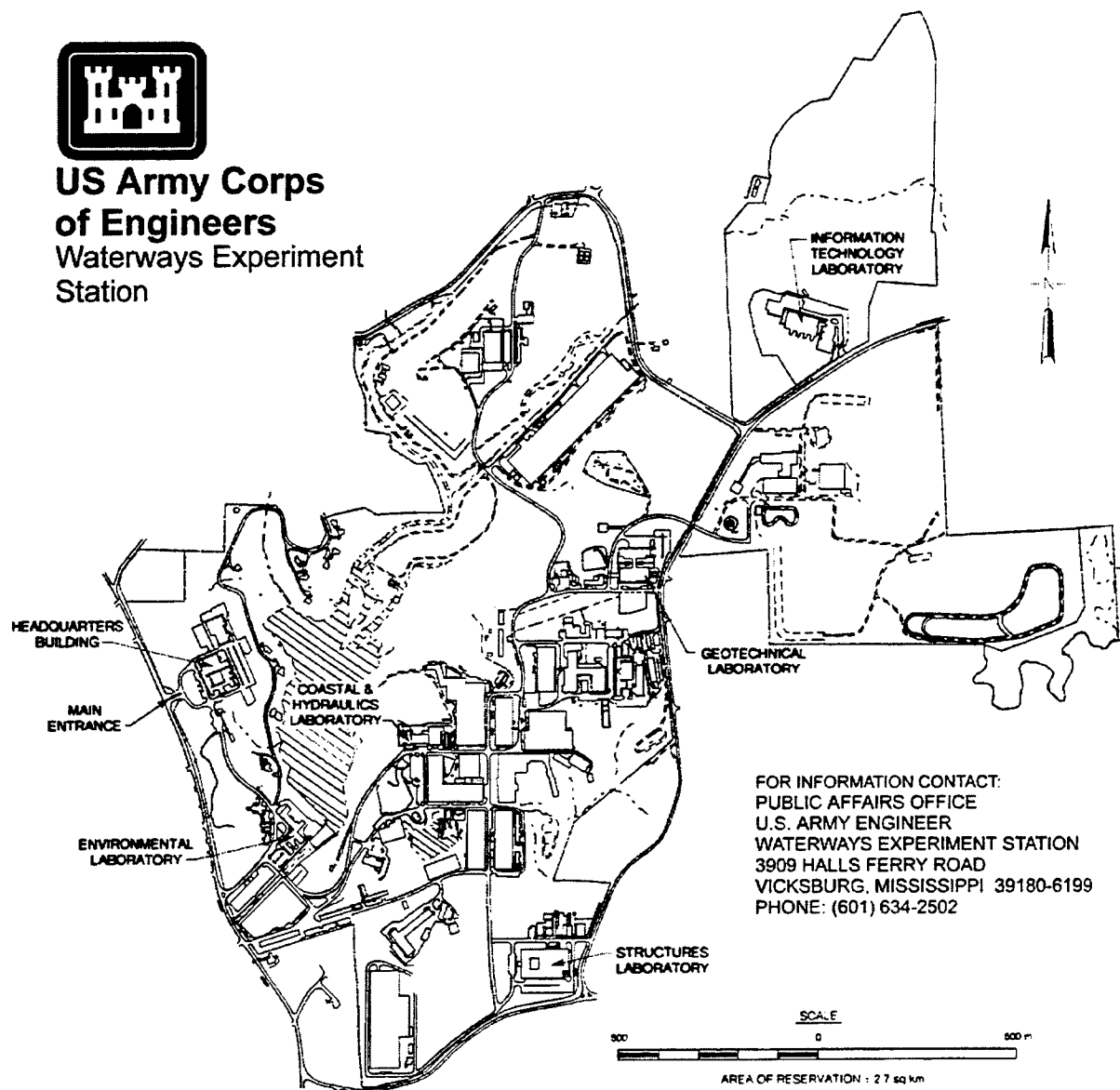
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# Preface

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Personnel at Edwards Air Force Base, Edwards, CA, are conducting a series of floral and fauna surveys. This is being done to check for Federally listed endangered or threatened species and to obtain information for an overall resource management plan. In the past, they have conducted surveys for tortoises, butterflies, birds, and eubranchipods (including tadpole, clam, and fairy shrimp). The report herein describes results of a survey for terrestrial macroinvertebrates conducted in 1996 by Dr. Gordon Pratt, University of California at Riverside, for the U.S. Army Engineer Waterways Experiment Station (WES) under Contract DACA39-39-96-0028. This report presents results from the first year of a 3-year study. Results of additional studies at the base will be published in annual reports similar to this.

During the conduct of this study, Dr. John Harrison was Director, Environmental Laboratory (EL), WES; Dr. Conrad J. Kirby was Chief, Ecological Research Division (ERD), EL; and Dr. Alfred F. Cofrancesco was Chief, Aquatic Ecology Branch, ERD.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Robin R. Cababa, EN.

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# 1 Introduction

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## Background

Edwards Air Force Base (EAB) is located in the Mojave Desert in southern California near Los Angeles. Terrain of potential value for terrestrial macro-invertebrates and other organisms consists of sand dunes, dry open hills, valleys, dry lakes or playas, smaller claypans, and pools. Vegetation around the playas consists of saltbush scrub; around the pools and claypans is saltbush scrub, Joshua tree woodlands, cottonwood and willow thickets, and mesquite bosque. Playas and most pools are devoid of macrophytes (Branchipod Research Group 1993). The uplands are largely composed of creosote bush scrub.

EAB personnel are conducting a series of floral and fauna surveys. This is being done to check for Federally listed endangered or threatened species and to obtain information for a complete resource management plan. Previous surveys have been conducted on tortoises, butterflies, birds, and eubrachipods (including tadpole, clam, and fairy shrimp). Surveys are being done to obtain information on endangered or threatened species, as well as common species, to provide data for the proposed habitat management plan. This report, which presents findings from 1996, is the first of three annual reports that will describe terrestrial invertebrates at EAB. In addition to the terrestrial invertebrates, aquatic invertebrates are also being studied and will be reported separately. A final report will synthesize results of both studies and recommend management options to protect or enhance resources at EAB.

Desert invertebrates of the western Mojave are highly seasonal and dependent on winter-spring rains. In this desert, everything depends on water and its availability. Many of the leaf-litter species, such as Jerusalem and camel crickets, Diplurans, centipedes, and millipedes, only occur at the soil surface during the moister months of the year ranging from November to March or April. During the rest of the year, they are buried deep within the soil. Other invertebrates, such as butterflies, moths, and leaf-feeding beetles, and herbivorous flies follow the availability of their specific food plants and occur only when they are either flowering or leafing out. Many bees, wasps, beetles, and flies seem to seasonally follow a particular nectar source. Even though the desert may appear extremely dry during the hottest times of the year, it comes alive with invertebrates at night, such as large tenebrionid beetles, wasps, ants, spiders, scorpions, and solfugids.

This behavior is a response to the desert sun's hot drying effects. It would seem by the great invertebrate variation, particularly of the insects, that they are well adapted to the desert's severe often unpredictably changing environment.

## **Purpose and Scope**

The purpose is to conduct a four-season survey of terrestrial macroinvertebrates in major habitats at Edwards Air Force Base, California. This is part of a 3-year study that started in 1996 and will end in 1998. This report includes data from the 1996 survey.

## 2 Study Area and Methods

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### Collecting Sites

The different localities for this survey were chosen to cover the base as widely as possible and as many different habitat types as possible. Unfortunately, there was some bias to these locations, since some areas were avoided because they require escorts and too much of their time to survey appropriately. These sites were defined from a central location with a half-mile<sup>1</sup> radius to form an approximate circular border. The sites chosen for the 1996 season are shown in Figures 1 and 2.

### Methods

Since the author of this report specializes in butterflies, all of these organisms were easily identified by sight in the field. Initial identifications of the remaining insects were done to the family level through the keys of Borror, Delong, and Triplehorn (1981). This was not a simple task since there are over 650 North American insect families, each of which exhibits a great variety of different forms.

Specimens were then organized within each family by morpho species or groups that appeared similar enough to be the same species. Once this was done, various keys were used in some cases to identify the species or genus of the different morpho species. For instance, there are keys to the grasshoppers of California (Strohecker, Middlekauff, and Rentz 1968), genera of flies of North America (McAlpine et al. 1981), ants of California (Wheeler and Wheeler 1973), and antlions of North America (Stange 1970). In these cases, keys were used for identifications down to the genus or species level and then followed up by examining specimens in a reference collection. If the specimen(s) appeared morphologically to fall within the morphological variability of the species or genus, then the identification was accepted.

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<sup>1</sup> To convert miles (U.S. statute) to kilometers, multiply by 1.609347.



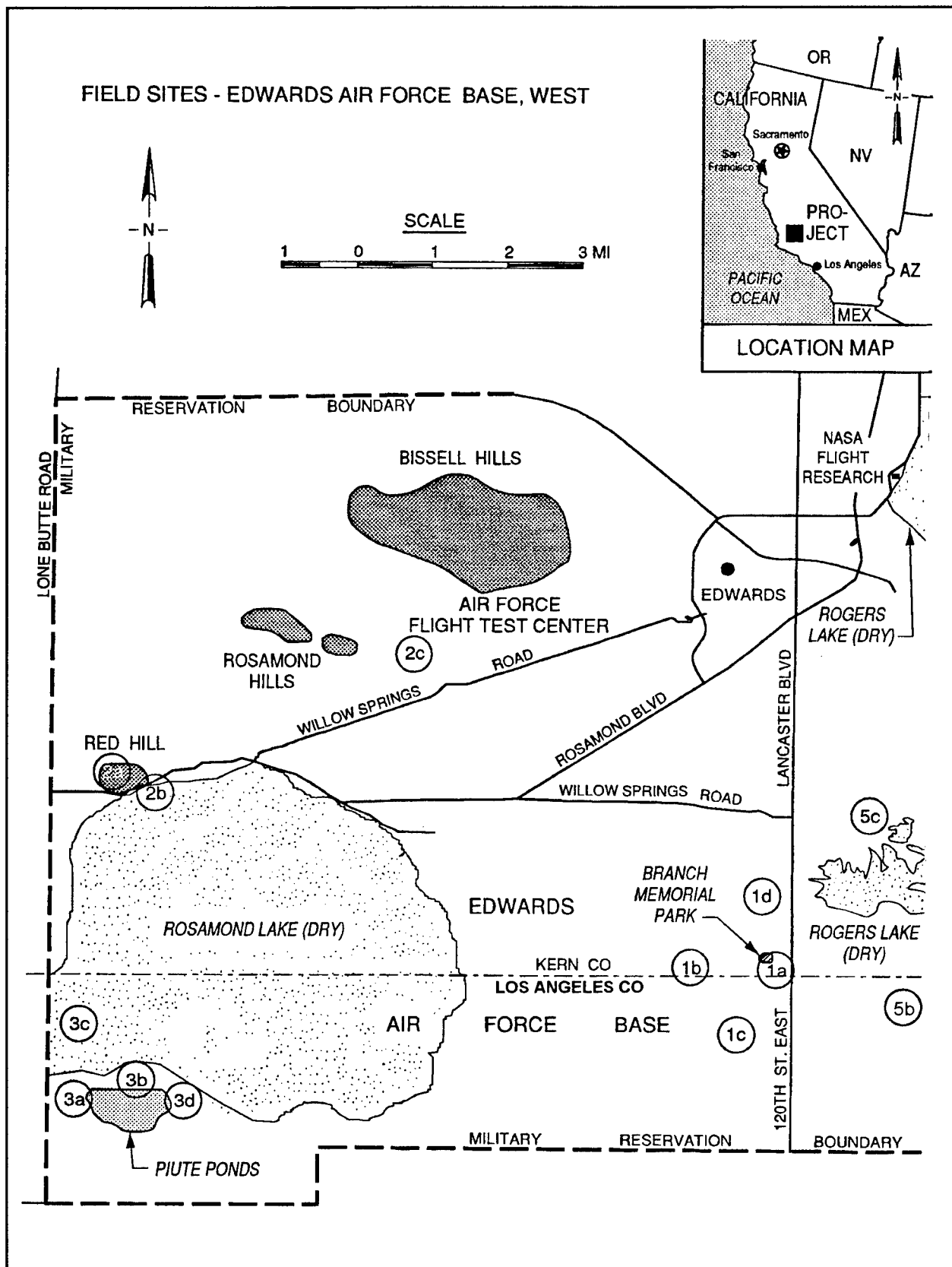


Figure 1. Sites on Edwards Air Force Base, West

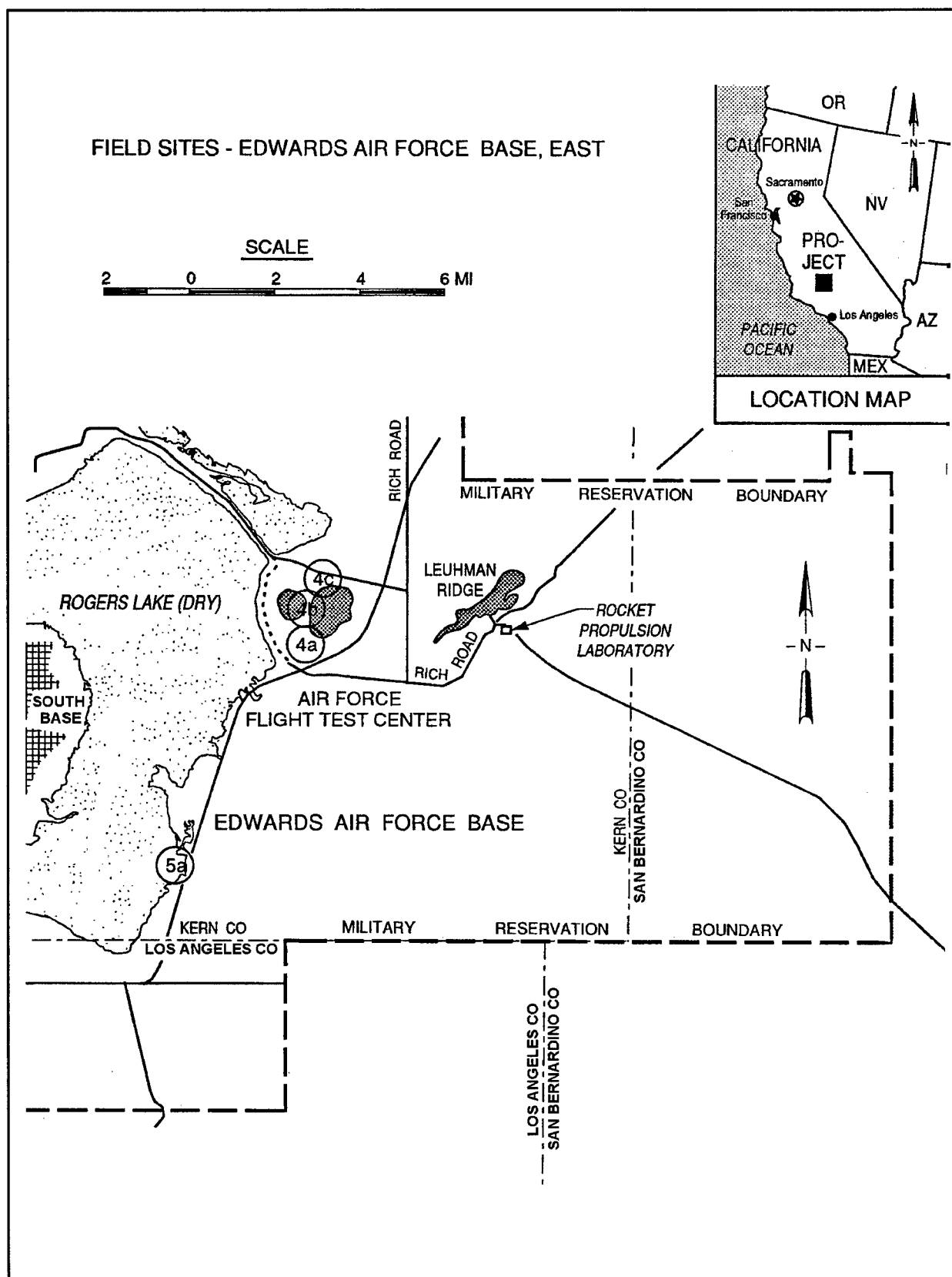


Figure 2. Sites on Edwards Air Force Base, East

In the other cases, the insect collection at the University of California at Riverside (UCR) was utilized exclusively for further identification. Most of these specimens in the collection had been previously identified by recognized authorities. The reason keys were not used with these groups is that keys were often lacking or not readily available because they were located in obscure places in the literature. Another problem with some keys is that they are broken into such small groups (like species complexes) making them virtually unusable to nonauthorities.

Identifications were done using the collection by scanning through specimens of the different species within each family of each species identified. Once the scanning was done (always with the aide of a microscope), the important characters that appeared to distinguish the species and genera within the family were determined. Then an effort was made, through the use of the determined characters, to match the species with one in the collection. With the lepidoptera, *The Moth Book* by Holland (1903) was of some additional help.

Once a determination was made, locality and abundance of the species within the collection also played important roles. If the specimen looked like two or three species in the collection, then the one species that had locality labels that overlapped that of the species on base was chosen. If more than one species had geographic patterns that overlapped the base, then the most common species was chosen. Often, once a determination was made, a combination of factors played a role in the acceptance of that determination. Only when there was little doubt due to morphological uniqueness was a species accepted with no overlapping locality labels.

Reliability of the identifications of the insects was most dependent on the number of species in UCR's collection and secondly on the keys. There is no better way to identify species than by utilizing a well-represented and curated collection. This collection was heavily biased towards the southwestern deserts, due to local collectors working this area more thoroughly than the rest of North America.

It is possible that some of these terrestrial organisms collected at the base have been misidentified. They could be due to misinterpretations of the characters used to identify the species or the absence of the species in reference collections. Some species and genera are lacking within UCR's collection because they have been sent out to authorities. These insects often are lent for 10 or more years until the authority has had a chance to work on them. Names can change over the years as new information becomes available. In some cases, misidentifications could be the result of confusing different forms or sexes of the same species, thereby listing one species as two. This problem was avoided by determining variability within each species of each family. Such errors are not uncommon since in the past some authorities have found males and females of the same species to be so different as to label them not only as distinct species but in different genera. Most misidentifications of species at the base will be at the species level, rather than at the genus level. Sibling or cryptic species require in most cases a key to distinguish them.

Reliability of some identifications can be variable. Since butterflies are the author's speciality, they are likely to be very accurate. The Diptera (true flies), antlions, ants (part of the Hymenoptera), and grasshoppers were probably next best identified because of availability and use of keys and an excellent personal reference collection. The Coleoptera (beetles) and the remainder of the Hymenoptera (bees and wasps) are also well represented in UCR's collection, so they were probably next best identified at least to the genus level.

### 3 Results

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Eighty percent of the terrestrial invertebrates collected at EAB (Table 1 and Appendix A) belong to four orders: Hymenoptera, Diptera, Coleoptera, and Lepidoptera (moths and butterflies). Over 95 percent were found in these orders plus four more (Orthoptera, Homoptera, Hemiptera, and Neuroptera). One very rare Chrysopid, *Pimachrysa albicostales*, and a new species of Scarabaeid, in the genus of *Serica*, were collected by this study. Only two specimens of the *Pimachrysa* were previously known. A total of 974 invertebrates were identified from EAB. It is likely that the final species list will contain over 1,000 organisms.

There are two invertebrates that give a particularly nasty and perhaps deadly bite. These are the desert recluse (*Loxosceles deserta*) and the black widow (*Latrodectus hesperus*) (see the spiders in Table A1, Appendix A). Both spiders can be quite common on base. The black widow has been only found just north of Branch Memorial Park, but should be throughout most of the base in old mammal holes, under rocks, logs, and other debris. The desert recluse, one of the most common spiders on base, was found at a number of localities. These organisms seem to prefer to hide beneath trash, such as old washing machines and refrigerators. Gloves should be worn when collecting amongst these materials. A number of desert recluses were also found beneath cottonwood and Joshua tree logs. Because of the venomness of these two spiders, not all that were seen were collected.

Although there are a number of scorpions on base (one of which has been identified), none of these are likely to be very toxic. The sting of most scorpions are usually painful for only a few minutes. The only highly noxious or deadly California scorpion is quite rare and only found along the Colorado River. It is more common in Arizona.

It is quite likely that there is a *Triatoma* species (kissing or conenose bug) on base, but at present it has not been found. There is a species in both China Lake and Fort Irwin (in the western Mojave Desert) in habitats similar to those found on EAB. This species was common in China Lake and Fort Irwin during 1994. Unfortunately, detailed surveys were not conducted at EAB during that year. This bug was not found during the 1996 season at any of the three bases. These organisms are quite noxious because they carry a trypanosome, the deadly

<b>Table 1</b> <b>Numbers of Invertebrate Species on Edwards Air Force Base, 1996</b>		
<b>Taxonomic Group</b>	<b>Number of Species</b>	<b>Percent of Total</b>
Spiders	19	2.0
Scorpions	1	0.1
Millipedes	1	0.1
Collembolans	1	0.1
Thysanura	2	0.2
Ephemeroptera	1	0.1
Odonata	11	1.2
Orthoptera	41	4.2
Isoptera	1	0.1
Dermaptera	1	0.1
Homoptera	34	3.5
Hemiptera	56	5.7
Thysanoptera	2	0.2
Neuroptera	20	5.7
Coleoptera	154	15.8
Trichoptera	4	0.4
Lepidoptera	135	13.9
Diptera	214	22.0
Hymenoptera	276	28.3
Total	974	
Coleoptera, Lepidoptera, Diptera, and Hymenoptera	775	80.0
Plus Orthoptera, Homoptera, Hemiptera, and Neuroptera	930	95.5

Chagas disease. Fortunately, the method of transmission is quite complex, so incidents of disease are unlikely. Not only must they bite but the bug must defecate in the wound, and the person must scratch the trypanosome into the wound. The only records of this disease in the United States are from Arizona, and the North American variety of the trypanosome is a less virulent form than exists in South America. More information on these insects and the transmission of Chagas disease can be found in Schmidt and Roberts (1981).

There are a number of biting flies on base. These belong to the families Ceratopoginidae (no seeums), Culicidae (mosquitoes), and Tabanidae (horse and deerflies). There are also a number of species of bees (Andrenidae, Anthophoridae, Apidae, Colletidae, Halictidae, and Megachilidae) and wasps (Pompilidae, Sphecidae, and Vespidae) that can give nasty stings. The most potent stings are from the large cicada killer *Sphecius convallis* and the tarantula hawk *Pepsis chrysothemia*.

## 4 Discussion

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There are at least two criteria that are important in determining the quality of a habitat and its value for preservation. One is the total number of species present and the other is the number of species considered to be threatened or endangered. Determining the total number of invertebrate species present in an area is not as difficult as determining the number of endangered species present. California desert invertebrates are poorly known, and EAB is no exception. For this reason, endangered invertebrates may not be easily recognized or identified. Previous descriptions in an area could be lacking. One biogeographic characteristic that is shared amongst most known California endangered invertebrates is their restricted localized ranges. Typically, most are endemic to very small areas. Therefore, it would be useful to identify species that exhibit restricted ranges or only occur at one or two very similar localities within EAB.

The species that exhibit restricted ranges on Edwards Air Force Base, i.e., unique species only found at one locality (Table 2), fall into two categories. One type will be species with actual restricted ranges, and the other will be rare species with wide ranges that were not encountered at the other localities simply because they are rare. The first type consists of true endemics, while the second type is identified as unique to the locality simply due to sampling bias. Since such rare species exhibit wide ranges, their frequencies should be relatively constant from one locality to the next. Therefore, the number of endemics should be the total number of unique species at a locality minus a relatively constant frequency of rare species. Unfortunately, the constant frequency of rare species is not known, so the next best thing will be the number of unique species to a locality. With increased surveys over time, rare species should be encountered at multiple localities, and eventually the number of unique species will equal the true endemics or the species with restricted ranges on base.

Of the 15 localities studied in this survey, only 2 exhibited more than 200 species, Sites 1a (362 species) and 3b (293 species) (Table 2). Because of time constraints, only 5 of the 15 localities had been searched for nocturnal insects with a mercury vapor light. Since both 1a and 3b were searched for nocturnal insects, they were both expected to exhibit larger insect totals than other localities that were only searched during the day; but still 1a and 3b exhibited numbers that far exceeded the other localities that had been searched for nocturnal insects.

<b>Table 2</b> <b>Total Species and Endemic Species per Locality at Edwards Air Force Base, 1996</b>				
Locality	Total Species	Number of Unique Species <sup>1</sup>	%Unique of Total Species	Habitat Types <sup>2</sup>
1a*	362	98	27.1	CW, SD, VP, SB, PO, MW, JT
1b	75	12	16.0	SD, VP, SB, MW, JT
1c	64	17	26.6	VP, SB, MW, JT
2a	118	18	15.3	CS, SB, SW
2b	67	9	13.4	CS, SB, SW
2c*	134	43	32.1	CS, SD, JT
3a	137	23	16.8	VP, SB, PO
3b*	293	103	35.2	VP, SB, PO
3c	89	13	14.6	VP, SB, JT
4a*	143	29	20.3	CS, SW, JT
4b	55	8	14.5	CS, SW, JT
4c <sup>3</sup>	101	15	14.9	CS, SW, JT
5a*	195	46	23.6	CS, SD, JT, DL
5b	138	28	20.3	VP, CS, SB, SD, MW, JT
5c	100	16	16.0	VP, SB, JT, DL
Note: * = Collection at night. <sup>1</sup> Number of species found only in that locality. <sup>2</sup> Habitat types are as follows: CW = Cottonwoods; SD = Sand dunes; VP = Vernal pools; SB = Saltbush scrub; PO = Ponds; MW = Mesquite woodland; CS = Creosote woodland; SW = Sandy washes; JT = Joshua tree woodland; DL = Dry lake playa. <sup>3</sup> On September 18, changed night lighting from 4a to 4c because Rich Road was closed due to construction.				

Only 2 of the 15 localities exhibited percent unique of total species above 30 percent (Table 2). One locality was 2c and the other was 3b. Site 2c was somewhat unique compared with the others, being that it was located at nearly 3,000 ft<sup>1</sup> elevation. All of the others so far studied for invertebrates at Edwards occurred well below this elevation. It is not surprising therefore that many of the species located at 2c were typical of the higher Mojave Desert. Three of the notable endemics of Site 2c were *Neduba ovata* (Gryllacrididae), *Philolithus setuosus* (Tenebrionidae), and *Givira mucida* (Cossidae). All three were common at higher elevations in Fort Irwin and China Lake. Because these species have much wider ranges throughout the Mojave, although they are localized within Edwards Air Force Base, they are not true localized endemics.

Site 3b (the north shore of Piute Ponds) had the highest number of unique species, as well as the highest percentage of unique to total species. Also, many of these unique species seem to require a permanent source of water. The collembolan species, which was found along the shores of the ponds, was not

<sup>1</sup> To convert feet to meters, multiply by 0.3048.



found elsewhere including any of the vernal pools, Branch Memorial Park pond, or the sewage ponds. This small and wingless invertebrate is not likely to have moved much into the desert. Many of the shore-inhabiting Carabid and three of the four tiger (Cicindelidae) beetles were found only along the shores of Piute Ponds. A sciomyid fly, *Pherbella vitalis*, a native parasite of snails, was only found along the northern edge of Piute Pond. Three tabanids were also only found around Piute Ponds. All of these semiaquatic and aquatic invertebrates, some with poor dispersal capacities, indicate that Site 3b is unique for the base and may have had permanent ponds long before man changed the area.

It was interesting that Site 2c, which was probably located the furthest from a water source, either permanent or vernal, had the only mayfly (Ephemeroptera), back swimmer (Notonectidae), and two of the four caddisflies (Trichoptera), all of which have aquatic larval stages. Perhaps the adults of these insects migrate out of the hot dry lowlands to aestivate or hibernate at cooler higher elevations. Site 2c is located near some of the highest peaks on base.

Some of the high species' diversities of areas with permanent water compared with other areas could be due to many insects remaining in diapause. The higher rainfall would arouse these species. Some of the species restricted to Site 3b may actually have much wider ranges. Those results may support or refute the idea that the ponds at Piute Ponds are much older than man's creation.

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# Appendix A

## List of Invertebrates at Edwards Air Force Base by Locality and Date

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The following is a list of terrestrial macroinvertebrates collected at Edwards Air Force Base during the 1996 season. Macroinvertebrates were collected at localities listed in Table A1. Species noted with an asterisk (\*) were collected by the author during a previous survey.

<b>Table A1 Localities Surveyed for Terrestrial Macroinvertebrates at Edwards Air Force Base, 1996</b>	
1a	Branch Memorial Park
1b	South end of Buckhorn Dry Lake
1c	Area 2 miles south of Branch Memorial Park
2a	Red Hill
2b	Northwest end of Rosamond Dry Lake
2c	East end of Rosamond Hills
3a	West side of Piute Ponds
3b	North side of Piute Ponds
3c	1.5 miles north northwest of Piute Ponds
4a	1 mile north of Mercury Boulevard and 1 mile east of Rogers Dry Lake
4b	Peaks of northeast side of Rogers Dry Lake
4c	1.5 miles northeast of the peaks
5a	Sand dunes 2.5 miles north of Avenue B on west side of Mercury Boulevard
5b	Mesquite woodland north of Avenue B and west of intersection with 140th Street
5c	West side of sewage ponds on west side of Rogers Dry Lake

Macro-invertebrate	Order	Family	Species	Localities	Dates
Spiders		Araneidae	<i>Meteteira foxi</i>	3a, 5c	Apr 4
		Clubionidae	<i>Agroeca</i> near <i>omata</i>	3b	Jun 6
			<i>Micaria</i> (immature)	5a	Jun 26
			<i>Syspira</i> (immature)	1a	Jan 13
		Dictynidae	<i>Argenna</i> sp.	3b	Jun 2
		Filistatidae	<i>Kukulcania</i> sp. (Female)	1a	Jan 13
		Gnaphosidae	<i>Herpyllus hesperolus</i>	3c	Nov 20
		Lycosidae	<i>Allocasa subparva</i>	1a	Aug 6
			<i>Pardosa</i> sp. (female)	3b	Jun 6
			<i>Schizocosa mccoocki</i>	3b	Oct 9
		Mimetidae	<i>Mimetus hesperus</i>	3b	Jun 6
		Philodromidae	<i>Tibellus chamberlini</i>	3b	Jun 6-Jul 11
		Pholcidae	<i>Psilochorus utahensis</i>	2c	Jun 13
		Salticidae	<i>Habronattus icenoglei</i>	5a	Jun 29
			<i>Marena minuta</i>	2c	Jun 13
		Sicariidae	<i>Loxoscelses deserta</i>	1a, 3c, 5b	Nov 1-Apr 18
		Theridiidae	<i>Latrodectus hesperus</i>	1a	Nov 8
			<i>Euryopis californica</i>	5a	Jun 29
		Thomisidae	<i>Xysticus californicus</i>	2a, 4b	Apr 9-May 2
Scorpions			<i>Hadrurus obsurus</i>	1a	Apr 16
Millipedes			<i>Orthoporus</i> sp.	2a, 4a	Nov 1-Mar 29
Insects	Collembola	Entomobryiidae	Species 1	3a	Apr 18
	Thysanura	Lepismatidae	Species 1	1a, 5c	Apr 11-Jun 26
		Machilidae	<i>Machilis</i> species	2c	Jun 13
	Ephemeroptera	Baetidae	<i>Baetis</i> species	2c	Jun 13
	Odonata	Aeshnidae	<i>Aeshna multicolor</i>	1a, 3a, 3b	May-Sep
			<i>Anax junius</i>	1a, 3a, 3b	Jun-Sep
		Libellulidae	<i>Libellula saturata</i>	1a, 2a	Jun-Aug
			<i>Pantala hymenaea</i>	5b	May-Jun
			<i>Pachydiplax longipennis</i>	1a, 3a, 3b	May-Aug
			<i>Sympetrum corruptum</i>	1a, 2a, 3a-b, 4a, 5b	May-Oct
			<i>Tramera lacerata</i>	1a, 3a, 3b, 4c	Jun-Aug
			<i>T. onusta</i> (rare)	3a	Jun
		Coenagrionidae	<i>Enallagma carunculatum</i>	1a-c, 2a, 3a-c, 5a-c	Apr-Sep
			<i>Ischneura cervula</i>	1a, 3a, 3b	Mar-Oct
			<i>I. denticollis</i>	3a	Apr
	Orthoptera	Acrididae	<i>Aeoloplides tenuipennis</i>	1a, 3a, 4b, 5a, 5c	Jun 13-Sep 18
			<i>Amphilitornus coloradus</i>	3a	Jul 11
			<i>Anconia integra</i>	2b, 3a, 4c, 5a-b	Mar 29-Sep 11
			<i>Boottettix argentatus</i>	2c, 4a	Jul 5-Sep 18
			<i>Chimarocephala californica</i>	3a-b	Apr 4-18
			<i>Cibolacris parviceps</i>	2b-c, 4a	Apr 2-Sep 18
			<i>Cordillacris occipitalis</i>	1a-c, 2b-c, 4c, 5a, 5c	May 15-Jun 26

Macro-Invertebrate	Order	Family	Species	Localities	Dates
			<i>Derotimena delicatulum</i>	1a, 4a, 5a	Jun 26-Sep 18
			<i>Eremiacris pallida</i>	1a, 3a-c, 5a, 5c	Jul 5-Sep 25
			<i>Hesperotettix viridis</i>	1c, 3a-c, 5c	Jun 26-Jul 11
			<i>Ligurotettix coquilletti</i>	2b, 4a, 4c, 5a	Jun 13-Sep 11
			<i>Melanoplus cinereus</i>	4c, 5a	Jun 26-Jul 5
			<i>M. devastator</i>	2a, 5a	May 2-Jul 5
			<i>M. yarrowii</i>	3b	Oct 3-9
			<i>Oedaleonotus enigma</i>	3c	Jul 11
			<i>Opeia obscura</i>	3a	Apr 18-Jul 11
			<i>Poecilotettix sanguineus</i>	2b, 5a	May 15-Jun 13
			<i>Psoloessa delicatula</i>	1a-b, 2a-c, 3a, 3c, 4a, 5a-c	Jun 26-Sep 11
			<i>Schistocerca vaga</i>	5b	Jul 5
			<i>Trimerotropis californica</i>	1b, 3b, 4a, 5a	Jun 6-Sep 18
			<i>T. inconspicua</i>	4a, 4b	Jul 5
			<i>T. pallidipennis</i>	1a, 2a-c, 3a-b, 4a-c, 5a	Apr 2-Oct 17
			<i>T. pseudofasciata</i>	all sites	Apr 2-Nov 8
			<i>T. rebellis</i>	all but 3a-c	May 9-Jul 8
			<i>Xanthippus olancha</i>	2b	May 2
		Tettigoniidae	<i>Ateloplus luteus</i>	1a	Jul 8
			<i>Capnobotes arizonensis</i>	4a	Jul 5
			<i>C. fuliginosus</i>	4a, 4c	Jul 5
			<i>Insara covilleae</i>	2c	Jun 13
			<i>Neduba ovata</i>	2c	May 2
		Gryllacrididae	<i>Ceuthophilus californianus</i>	1a, 4c	Apr-May
			<i>C. hesperus</i>	1a, 4c	Apr-May
			<i>Ammobaenetes</i> sp.	1a	May 30
			<i>Stenoplematus</i> sp.	1a, 5a	Jan-May
		Gryllidae	<i>Gryllus assimilis</i>	1a, 2c, 3a-b, 4c, 5a, 5c	May 15-Sep 11
		Tanaoceridae	<i>Tanaocerus koebelii</i>	2c	Mar 29
	Dictyoptera	Mantidae	<i>Litaneutra minor</i>	1a, 5a, 3b	May 15-Jul 8
			<i>Stagmomantis californica</i>	3c	Sep 15
		Polyphagidae	<i>Arenivaga apache</i>	1a, 2c, 4a, 5a	Apr 16-Sep 11
			<i>Arenivaga</i> sp.	1a	Aug 6-Sep 15
			<i>Eremoblatla subdiaphana</i>	5a	Sep 11
	Isoptera	Rhinotermitidae	<i>Heterotermes</i> sp.	1a, 2b, 3a, 4a	Most of year
	Dermaptera	Carcinophoridae	<i>Euborellia</i> sp.	1b	Mar 18
	Homoptera	Delphacidae	<i>Delphacodes</i> sp.	2c, 3a, 3b	Jun 6-Sep 4
			Species 1	3a	Jun 6
		Cixiidae	<i>Oecleus decens</i>	3b, 4a, 5b	May 9-Sep 11
			<i>Oliarus zyxus</i>	3b, 5b	Apr 11-Jun 6
			Species 1	5b	Sep 11
		Dictyopharidae	<i>Acinaca</i> sp.	5a,	Jun 13
			<i>Orgerius concordus</i>	2c	Sep 11

Macro-Invertebrate	Order	Family	Species	Localities	Dates
		Flatidae	<i>Ormenis saucia</i>	1a, 4b	Jul 5-Aug 6
			Species 1	1b	Jul 8
		Issidae	Species 1	3a	Jun 6
		Membracidae	<i>Multareis cornulus</i>	4a-c	May 9-Jul 5
			<i>Multareoides bifurcatus</i>	2a, 4a, 4c	Jul 5-Nov 1
		Cicadellidae	<i>Aceratogallia californica</i>	1a, 2a-b, 3b-c, 4a-b, 5a	Apr 11-Oct 17
			<i>Acinopterus dulchellus</i>	5a, 5c	May 15-Sep 11
			<i>Acinopterus</i> sp.	5a-c	Apr 11
			<i>Ballana</i> sp.	1a, 5c	Apr 11-16
			<i>Cochlorhinus</i> sp.	5b	Apr 11
			<i>Deltocephalus fuscinevrosus</i>	3a	Jun 6
			<i>Empoasca fabae</i>	3a-b, 5a	Apr 4-Jun 26
			<i>Norvellina</i> sp.	2c	Jun 13-Oct 17
			<i>Opsius stactogalus</i>	1a-c, 3b-c, 5a-c	May 30-Aug 6
			<i>Scaphytopius irroratus</i>	2a	Oct 17
			<i>Texananus oregonus</i>	2c, 3b	Jun 6-13
			<i>Xerophloea peltata</i>	3b	Jun 6
			Species 1	3b, 5c	Jun 6-Sep 11
			Species 2	3b	Jul 11
			Species 3	3b	Apr 18
			Species 4	3a, 4a	May 9-Jun 6
			Species 5	5a	Apr 11
			Species 6	4c	Jul 5
			Species 7	2a, 2c	Jun 13-Oct 17
		Cicadidae	<i>Okanagana vanduzeei</i>	4a	Jul 11
		Pysllidae	Species 1	3b	Apr 4
		Aphididae	Species 1	3b	Jul 11
	Hemiptera	Alydidae	<i>Alydus pluto</i>	1a, 3a, 3c	Jun 6-Jul 11
			<i>Tallius setosus</i>	2a, 3a	May 2-Jun 6
		Anthocoridae	<i>Anthocoris</i> sp.	1c	Jul 8
			<i>Orius tristicolor</i>	1a-b, 2a, 3a-c, 4a-b, 5a-c	Apr 4-Oct 22
		Coreidae	<i>Merocoris curtatus</i>	5b	Sep 11
		Corixidae	<i>Corisella decolor</i>	1a-b, 2c, 3b, 5a	Apr 18-Nov 8
		Cydnidae	<i>Pangaeus congruus</i>	1a, 4c	May 9-Jul 8
		Lygaeidae	<i>Emblethis vicarius</i>	1a, 2a	Mar 29-Jul 8
			<i>Geocoris pallens</i>	1a-b, 2b, 3b, 4a, 5a	Apr 9-Oct 22
			<i>Lygaeus kalmii</i>	1a, 2b	Apr 16-Jun 13
			<i>Neacoryphus lateralis</i>	2c	Oct 17
			<i>Nysius tenellus</i>	1a, 2b-c, 3a-c, 4a, 5a-c	Mar 18-Oct 22
			<i>Pseudopamera nitidula</i>	2c, 4c	Mar 29-May 9
			<i>Xyonysius californicus</i>	3c	Jun 6
		Miridae	<i>Chaetophylidea moerens</i>	1a, 4c, 5a, 5c	Apr 9-16
			<i>Chlamydatus monilipes</i>	2c, 4c	Mar 29-May 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Deraeocoris brevis</i>	2c	Jun 13
			<i>Hadronema princeps</i>	2b, 4a, 5a	Apr 9-May 2
			<i>Haplomachides consors</i>	4c, 5a	Apr 11-May 9
			<i>Irbisia</i> sp.	2b, 5c	May 2-15
			<i>Lopidea confraterna</i>	2b, 4c, 5a	May 2-15
			<i>Orthotylus</i> sp.	1a, 3c	Sep 25-Oct 9
			<i>Parthenicus picicollis</i>	2a, 2c, 4a	May 9-Oct 17
			<i>Phytocoris albidopictus</i>	1a, 2c, 4c	May 9-Jun 13
			<i>P. ingens</i>	4c	May 9
			<i>P. plenus</i>	2c	Jun 13
			<i>Phytocoris ramosus</i>	2c, 4c	Apr 2-Jun 13
			<i>Rhinocloa forticornis</i>	3c, 5a, 5c	Jul 11-Oct 22
			<i>Taylorilgus pallidulus</i>	all sites	Apr 9-Oct 22
			Species 1	5a	Apr 11
			Species 2	5a-c	Apr 11-Sept 11
			Species 3	1a, 5c	May 30-Sep 11
			Species 4	5b	Apr 11
		Nabidae	<i>Nabis americanoferus</i>	3a, 5a-b	Apr 11-Oct 9
		Notonectidae	<i>Notonecta kirbyi</i>	2c	Jun 13
		Pentatomidae	<i>Acrosternum hilare</i>	2b	Aug 2
			<i>Brochymena sulcata</i>	5b	Jun 26
			<i>Chlorochroa sayi</i>	1a, 2c, 3a-c, 4a-c, 5a, 5c	Apr 2-Sep 11
			<i>Dendrocoris contaminatus</i>	2a, 4a, 4c	May 2-9
			<i>Perillus splendidus</i>	2b	May 2
			<i>Tepa brevis</i>	3a, 4b	Apr 9-Jun 6
			<i>Thyanta custator</i>	2c	Jun 13
			<i>T. pallidovirens</i>	3b, 4c	Jul 11-Aug 2
		Reduviidae	<i>Rasahus biguttatus</i>	3b	Jun 6
			<i>Sinea diadema</i>	1b, 3a, 3c	Jun 6-Oct 9
			<i>Zelus renardii</i>	1a, 1c, 2a, 3a-c, 5b-c	Jun 6-Oct 9
		Rhopalidae	<i>Arhyssus lateralis</i>	2a-b, 3a, 4a-b	Mar 29-Jul 11
			<i>A. scutatus</i>	5c	Apr 11
			<i>Aufeius impressicollis</i>	3a	Jul 11
			<i>Boisea rubrolineata</i>	3b	Jul 11
			<i>Harmostes reflexus</i>	1a, 2a, 3b-c, 5a-b	Mar 29-Sep 25
			<i>Liorhyssus hyalinus</i>	2b, 3c, 4a-b	Apr 9-Nov 1
		Saldidae	<i>Saldula pallipea</i>	3a-b, 5c	Apr 4-Jul 11
		Threocoridae	<i>Corimelaena lateralis</i>	3b	Jul 11
		Tingidae	<i>Corythucha morrilli</i>	5a	Apr 11
			<i>Leptonypha minor</i>	5c	Jun 26
	Thysanoptera	Thripidae	Species 1	3a	Jun 6
			Species 2	3a	Jun 6
	Neuroptera	Inocellidae	<i>Inocella inflata</i>	3b	Apr 11

Macro-Invertebrate	Order	Family	Species	Localities	Dates
		Chrysopidae	<i>Allochrysa arizonica</i>	5a	Apr 11
			<i>Chrysopa carnea</i>	1a-c, 3b-c, 4a, 5a-b	Mar 18-Oct 9
			<i>C. plorabunda</i> gp	1a	Jul 8
			<i>C. nigricornis</i> gp	1a	Aug 6
			<i>Eremochrysopa punctinuris</i>	1b, 3b-c, 4c, 5b-c	Apr 9-Oct 9
			<i>Nothochrysa</i> nr <i>californica</i>	4a	Nov 1
		Hemerobiidae	<i>Hemerobius pacificus</i>	1a	May 30
			<i>Micromus subanticus</i>	3b	Oct 9
		Myrmeleontidae	<i>Brachynemurus carrizonus</i>	1a, 2c, 3b, 4c	Jun 13-Sep 4
			<i>B. coquilletti</i>	1a, 3b, 4c, 5a	Jun 6-Sep 11
			<i>B. eiseni</i>	4a	Sep 18
			<i>B. ferox</i>	1a	Aug 6
			<i>B. intermedius</i>	2c, 4c, 5a	Sep 4-18
			<i>B. longipalpis</i>	1a-b, 2c, 3b, 4a, 4c	Jun 13-Sep 4
			<i>B. minusculus</i>	1a	Sep 25
			<i>B. niger</i>	1a, 5a	Jul 8-Sep 25
			<i>B. quadripunctatus</i>	1a	Jul 8
			<i>B. sackeni</i>	5a	Apr 11
			<i>B. singularis</i>	1a, 5a	Sep 11-25
	Coleoptera	Alleculidae	<i>Hymenorus montivagos</i>	1a, 3b	May 30-Jul 11
		Anobiidae	<i>Megorama ingens</i>	1a	Jul 8
			<i>Tricorynus mutans</i>	2c	Jun 13
			<i>Xeranobium desertum</i>	1a	Aug 6
			<i>X. laticeps</i>	2c, 4c	Jul 5-Sep 4
			Species 1	2c	Jun 13
			Species 2	1a, 2c	Jul 8
			Species 3	1a, 3b	Jun 6-Jul 8
		Anthicidae	<i>Anthus nanus</i>	4b	Jul 5
			<i>A. punctulatus</i>	1a, 3b	Jul 8-11
			<i>Notoxus calaratus</i>	1a	Jul 8
			<i>N. robustus</i>	3b	Jun 6
			<i>Omnnadus floralis</i>	2c, 5a	Sep 4-11
			<i>Vascusus confinus</i>	3b, 5a-c	Jun 26-Jul 11
			Species 1	2c, 3b	Jun 13-Jul 11
		Bruchidae	<i>Acanthoscelides</i> sp.	1b-c, 5a-b	Apr 11-Jul 8
			<i>Algarobius prosopis</i>	1a, 5b	Sep 11-25
			<i>Mimosestes protractus</i>	5b	Sep 11
			Species 1	2a	Jun 13
			Species 2	3b	Jun 6
		Buprestidae	<i>Acmaeodera lanata</i>	2a,3a, 4a, 5a-b	May 2-Jun 13
			<i>A. labyrinthica</i>	1a, 5a	Apr 11-Jun 6
			<i>Chrysobothris debilis</i>	5b	May 15
			<i>Hippomelas oblitterata</i>	4a-c	Jul 5



Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Hippomelas near fulgida</i>	3b	Aug 2
		Carabidae	<i>Agonoderus maculatus</i>	2c, 4c	Jul 8-Aug 16
			<i>Agonum funebre</i>	3a, 3b	Apr 18-Jul 11
			<i>Anisodactylus</i> sp.	1a, 3b	Jul 5-Sep 5
			<i>Armara insignis</i>	2a	May 2
			<i>Bembidion bifossulatum</i>	3a-b	Apr 4-Jul 11
			<i>B. Insulatum</i>	3b	Apr 18
			<i>B. variegatum</i>	3b	Apr 18-Aug 2
			<i>Bradycellus nitidus</i>	3a	Apr 4
			<i>Celia californica</i>	1a, 5c	Apr 11-16
			<i>Celia</i> sp.	1a, 3a-b	Apr 4-Jul 11
			<i>Harpalus lascivus</i>	3a	Apr 4
			<i>Lebia perita</i>	3b	Jun 6
			Species 1	3b	Jul 11
			Species 2	3a	Apr 4
			Species 3	3b	Jul 11
		Cerambycidae	<i>Amanus pectoralis</i>	3a	Jun 6
			<i>Crossidius coralinus</i>	3a, 3c	Jul 11-Oct 11
			* <i>C. hirtipes</i>	1c	Oct 11
			<i>C. suturalis</i>	1a	Sep 15-25
			<i>Derobrachus geminatus</i>	1a	Jul 8-Aug 14
		Chrysomelidae	<i>Altica carinata</i>	1a	Mar 18
			<i>Chaetocnema ectypa</i>	3a-c	Jun 6-Jul 11
			<i>Dibolica undecimpunctata</i>	2c, 3a-b, 4c	Jun 6-Oct 9
			<i>Galerucella xanthomelaena</i>	1a, 2a, 3b, 4c	May 2-Aug 6
			<i>Pachybrachys desertus</i>	2c, 4a, 4c	Jun 13-Nov 1
			<i>Phyllotreta</i> sp.	1a, 2c	Jun 13-Jul 8
			Species 1	1a, 3b	Aug 2-6
			Species 2	1a, 2b	May 2-Jul 8
		Cicindelidae	<i>Cicindela haemorrhagica</i>	3a-b	Jun 6-Oct 9
			<i>C. oregona</i>	1a, 3a-b	Apr 4-Oct 3
			<i>C. tranqueberrica</i>	3b	Oct 9-Apr 4
			<i>C. willistoni</i>	3b	Jun 6
		Cleridae	<i>Cymatodera oblita</i>	1a, 4a	Aug 6-Sep 18
			<i>C. punctata</i>	1a	Aug 6
			<i>Enoclerus laetus</i>	1a, 1b, 5b	Sep 11-25
			<i>Loedelia maculicollis</i>	4a	May 9
			<i>Phyllobaenus scaber</i>	4c	May 9
			<i>Trichodes ornatus</i>	2a, 4a-b	May 2-9
		Coccinellidae	<i>Coccinella novemnotata</i>	3a-b	Jun 6-Oct 3
			<i>Hippodamia convergens</i>	1a, 2b, 3a-c, 5c	Mar 18-Oct 3
			<i>Hippodamia</i> sp.	4c	May 9
			<i>Hyperaspis</i> sp.	2a	Oct 17

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Olla v-nigrum</i>	1a	Aug 6
		Curculionidae	<i>Apleurus angulans</i>	3a, 4a, 5b	Jul 11-Nov 1
			<i>Ophryastes argentatus</i>	4a	Jul 5
			<i>Sibinia setosus</i>	1b	Jul 8
			<i>Smicronyx imbricatus</i>	1a	Jul 8
		Dermestidae	<i>Anthrenus lepidus</i>	1a, 3a-b, 5a-b	Mar 18-Jun 6
			<i>A. rufipennis</i>	5b	Apr 11
			<i>Cryptorhopalum apicale</i>	4b	May 9
			<i>Dermestes marmoratus</i>	1a	Aug 6
			<i>Novelsis uteana</i>	1a	May 30-Jul 8
			<i>Trogoderma variabile</i>	2a-c, 4c	May 2-Jul 5
		Dytiscidae	<i>Hygrotus</i> sp.	1d	Apr 18
		Elateridae	<i>Aeolus</i> sp.	3b	Jun 6
			<i>Esthesopus dispersus</i>	2c	Jun 13
			<i>Horistonotus inanus</i>	1a	Mar 18
			<i>Octinodes frater</i>	2c, 4c	Apr 2-May 9
			<i>O. shaumi</i>	1a, 4c, 5a	May 9-Jul 8
		Helodidae	<i>Cyphon variabilis</i>	3b	Jul 11-Aug 2
		Heteroceridae	<i>Heterocerus gnatho</i>	1a, 2a, 3b, 5a	May 30-Sep 11
		Hydrophilidae	<i>Berosus punctulatus</i>	3b	Jul 11-Aug 2
			<i>Berosus</i> sp.	3b	Jul 11
			<i>Hydrophilus triangularis</i>	3b	Jul 11-Aug 2
			<i>Troposternus lateralis</i>	3b	Jul 11
		Meloidae	<i>Cordylospasta opaca</i>	4a, 5b	Apr 9-11
			<i>Cysteodemus armatus</i>	5a	May 9
			<i>Epicauta corybantica</i>	1a-b, 3a-c	Sep 25-Oct 22
			* <i>Epicauta puncticollis</i>	3c	Jun 9
			<i>Eupompha elegans</i>	1a, 5a	May 15-30
			<i>Lytta auriculata</i>	1c	Apr 16
			<i>Lytta magister</i>	4a	May 9
			<i>Lytta stygica</i>	2c	Mar 29
			* <i>Lytta vulnerata</i>	1c, 3a	Oct 11
			<i>Nemognatha macswaini</i>	4a	May 9
			* <i>Pleurospasta mirabilis</i>	1a, 3b	Jun 6
			<i>Zonitis atripennis</i>	1a	Sep 25
		Mordellidae	<i>Anthobates nubilis</i>	5b-c	Sep 11
			<i>Mordella albosutura</i>	2a, 4c	May 2-9
			<i>Mordellistena</i> sp. 1	1a, 4c	Apr 16-May 9
			<i>Mordellistena</i> sp. 2	1a	Jul 8
		Melyridae	<i>Amecocerus</i> sp. 1	1c, 4a, 4c, 5b	Apr 9-16
			<i>Amecocerus</i> sp. 2	4c	May 9
			<i>Attalus difficilis</i>	5a	Apr 11
			<i>Attalus oregonensis</i>	1b, 2a, 3b, 4a, 4c, 5a, 5c	May 9-Jun 26

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Attalus santarosae</i>	4a-b	May 9
			<i>Collops limbellus</i>	5a	May 15
			<i>Emmenotarsus</i> sp. 1	2b, 5a	Mar 27-Apr 11
			<i>Eschatocrepis constrictus</i>	1a, 2a-b, 4a-b, 5b-c	Mar 29-Sep 11
			<i>Eutrichopleurus mucidus</i>	3a, 5a-b	Apr 11-Jun 6
			<i>Pristoscelis irwini</i>	4b, 5c	May 9-Sep 11
			<i>Pristoscelis schlingeri</i>	1a, 5a-c	Apr 11-16
			<i>Pristoscelis</i> sp.	2a	May 2
			<i>Tanaops lobulatus</i>	2a	May 2
		Nitidulidae	Species 1	1a	Aug 6
		Oedemeridae	<i>Rhinoplatia ruficollis</i>	4a	May 9
		Scarabaeidae	<i>Aphodius lividus</i>	1a, 5a	Aug 6-Sep 25
			<i>Cremastocheilus schaumii</i>	1b	Mar 18
			<i>Cyclocephala longula</i>	1a, 3b	May 30-Aug 16
			<i>Diptotaxis subangulata</i>	1a, 5a	Jul 8-Sep 15
			<i>Gymnopyge hopliaeformis</i>	2b, 4a	May 2-9
			<i>Ligyris gibbosus</i>	1a, 3b	Jul 11-Sep 25
			<i>Phobetus majavus</i>	4c	May 9
			<i>Serica elongatula</i>	4c, 5a	May 9-15
			<i>Serica</i> new species	5a	May 15
		Staphylinidae	<i>Betonuchus</i> species	3b	Jul 11
			<i>Coproporus</i> species	2c	Jun 13
			<i>Philonthus cruentatus</i>	1a, 2c, 3b, 5a	May 30-Sep 11
			Species 1	2c	Jun 13
		Tenebrionidae	<i>Abolus verrucosus</i>	1a, 2c, 3b	Apr 2-Aug 6
			<i>Aloephus</i> species	2a	Jun 13
			<i>Apsena rufipes</i>	5c	May 15
			<i>Araeoschizus andrewsi</i>	1a	May 30
			<i>Auchmobius picipes</i>	1c	Jul 8
			<i>Blapstinus pulverulentus</i>	1a-b, 3b, 5a	Apr 16-Aug 2
			<i>Blapstinus</i> species	1a	Apr 16-Aug 6
			<i>Coniontis ellyptica</i>	3a-c	Apr 18-Jul 11
			<i>Coniontis</i> species	2c	Mar 29
			<i>Eleodes armata</i>	all sites	all year
			<i>Eleodes</i> Species 1	1a-b, 2c, 3b, 5a-b	Mar 29-Nov 8
			<i>Eleodes</i> Species 2	1c	Nov 8
			<i>Edrotes ventricosus</i>	1a, 5c	Sep 25-Apr 11
			<i>Eusattus muricatus</i>	1a-b, 5b	Mar 18-Jun 6
			<i>Metopoloba</i> sp.	1a	Aug 6-Sep 15
			<i>Philolithus setuosus</i>	2c	Sep 4
			<i>Trogloderus costatus</i>	1a, 5a	Apr 16-Aug 16
			Species 1	2a, 2c, 4c, 5a, 5c	Mar 29-Jul 5
			Species 2	2c	Mar 29

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 3	2c	Sep 4
	Trichoptera	Hydropsychidae	Species 1	2c	Jun 13
			Species 2	1a	May 30
		Leptoceridae	Species 1	2c	Jun 13
			Species 2	1a	Aug 6
	Lepidoptera	Arctiidae	<i>Apantesis proxima</i>	1a, 3b	Jul 11-Nov 20
		Cossidae	<i>Givira mucida</i>	2c	Jun 13-Sep 4
			<i>Hypopta palmata</i>	3b	Jul 5-Aug 2
			<i>Hypopta</i> species	1a	May 30
		Geometridae	<i>Chlorochalmys</i> species	5a	Sep 11
			<i>Eubarnesia ritaria</i>	2c, 4c, 5a	May 9-Sep 18
			<i>Glaucina erroraria</i>	2c	Jun 13
			<i>G. mcdunnoughi</i>	2c, 4a	Apr 2-Oct 17
			<i>Hesperumia sulphuria</i>	3b	Jun 6
			<i>Narraga fimetaria</i>	1a	Jul 8
			<i>Nasusina inferior</i>	1a	May 30
			<i>Perizoma custodiata</i>	4c, 5a	May 9-Oct 22
			<i>Semiothisa colorata</i>	2c, 4c	Apr 2-Jun 13
			<i>S. cyda</i>	1a	May 30-Aug 6
			<i>Semiothisa</i> species	1a	Aug 6
			<i>Synchlora aerata</i>	1a	Jul 8-Aug 6
			Species 1	1a	Nov 8
		Hesperiidae	<i>*Erynnis funeralis</i>	1c	Oct 11
			<i>*Heliotes ericetorum</i>	1c	Oct 11
			<i>Pyrgus communis</i>	1a, 2a, 3a-b	May 30-Jun 6
			<i>Pholisora libya</i>	1a-b, 2a 5a-b	May 15-Sep 15
			<i>Polites sabuleti</i>	1a, 3a-b	Jun 6-Oct 11
			<i>Pseudocopaodes eunis</i>	1a-b, 3a-c	Apr 19-Oct 11
			<i>Hylephila phyleus</i>	3b	Aug 2-Oct 9
			<i>Atalopedes campestris</i>	3b	Jun 6-Oct 11
		Lasiocampidae	<i>Malacosoma incurvum</i>	2c, 3b	Jun 6-13
		Lycaenidae	<i>Leptotes marinus</i>	1a	Jun 6-Aug 6
			<i>Brephidium exilis</i>	all localities	Mar 18-Nov 20
			<i>Icaricia acmon</i>	2b, 3b, 3c	Mar 29-Jun 6
			<i>Strymon melinus</i>	1b, 3c, 5a-b	Mar 30-Sep 11
		Lybythiidae	<i>Libytheana bachmanii</i>	1a	Nov 8
		Noctuidae	<i>Agrotis ipsilon</i>	1a, 3b, 4a	May 30-Oct 9
			<i>Autographa californica</i>	1a, 5a	Oct 22-Nov 8
			<i>Bulia deducta</i>	1a	Jul 8
			<i>Canochares arizonae</i>	1a, 2c	Jul 13
			<i>*Catocala junctura</i>	1a	Sep 15
			<i>Copieculia eulipes</i>	1a	Aug 6
			<i>Euxoa auxiliaris</i>	1a	Aug 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>E. messoria</i>	1a, 2c, 3b, 5a	Oct 9-Nov 20
			<i>E. olivia</i>	1a, 2c, 3b, 4c, 5a	May 9-Nov 20
			<i>E. recula</i>	1a, 2c, 5a, 5c	Oct 17-Nov 8
			<i>E. serricornis</i>	1a	Apr 16
			<i>E. silens</i>	1a	May 30
			<i>E. terrena</i>	1a	Aug 6
			<i>E. tristicula</i>	2a, 4c	Apr 2-Oct 17
			<i>Heliothis obsoleta</i>	3b, 4a	Jul 11-Oct 9
			<i>Heliolonche pictipennis</i>	1a, 5b	Apr 11-18
			<i>Helotropha reniformis</i>	3b	Jun 6-Aug 2
			<i>Heteranassa minor</i>	1a, 5a	May 30-Sep 11
			<i>Lacinipolia audabilis</i>	4c	May 9
			<i>L.acinipolia</i> Species 1	1a	Sep 25
			<i>Lacinipolia</i> Species 2	2c	Oct 17
			<i>Nonagria</i> species	1a, 3b	Jul 8-Aug 6
			<i>Platysenta</i> species	4c	May 9
			<i>Porosagrotis</i> species	5a	Oct 22
			<i>Protorthodes affkeni</i>	1a, 2c, 3b, 4a, 5a	Sep 11-Oct 17
			<i>Pseudaletia farcta</i>	1a, 3b	Jun 6-Aug 6
			<i>P. unipuncta</i>	1a, 4a	Aug 6-Sep 18
			<i>Pseudanarta singula</i>	1a, 2c, 3b, 4c	Oct 17
			<i>Rhizagrotis albalis</i>	1a, 4a	May 9-30
			<i>Rhynchagrotis anchocelioides</i>	1a,2c,3b,4c	May 9-Oct 17
			<i>Schinia dobla</i>	4a	Apr 9
			<i>S. separata</i>	1a, 2c, 3b	Sep 25-Oct 17
			<i>S. species</i>	1a, 4a, 5a	Sep 11-25
			<i>Scotogramma trifolii</i>	1a, 5a	Aug 6-Sep 25
			<i>Spaelothis chandestina</i>	1a, 2c	Jun 13-Oct 17
			<i>S. havilae</i>	2c	Apr 2
			<i>Spodoptera exugua</i>	1a, 4a, 5a	Aug 6-Oct 22
			<i>S. ornithogalli</i>	1a	Apr 6-Aug 6
			<i>Synedoida ochracea</i>	4a	Sep 18
			<i>S. tejonica</i>	5a	Sep 11
			<i>Trichoplusia ni</i>	1a, 4a, 5a	Sep 11-25
			<i>Tridepia nova</i>	1a, 2c, 3b, 4a	Jun 13-Sep 18
			<i>Tryocnemis saporis</i>	4c	May 9
			<i>Trudestra arida</i>	1a, 2c, 3b, 5a	Jun 6-Nov 20
			<i>Ulosyneda</i> species	3b	Oct 9
			Species 1	1a	Sep 25
			Species 2	2b	Mar 29
			Species 3	1a, 2c	Jun 13
			Species 4	1a	Sep 25
			Species 5	3b	Jul 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 6	1a, 3b	Aug 6-Oct 9
			Species 7	3b	Jun 6
			Species 8	1a	Nov 8
			Species 9	1a	Apr 16
			Species 10	2c	Apr 2
		Nymphalidae	<i>Charidryas neumogeni</i>	4a-b	Apr 9-May 9
			<i>Danaus gilippus</i>	1c	Oct 11
			<i>D. plexippus</i>	1a, 3b	Mar 18-Oct 9
			<i>Nymphalis antiopa</i>	1a, 3b	Mar 18-Jun 6
			<i>Polygonia satyrus</i>	3b	Jul 11
			<i>Vanessa atlanta</i>	2a, 3b	Mar 30-Oct 9
			<i>V. annabella</i>	1a-c, 3b, 4c	Mar 18-Oct 11
			<i>V. cardui</i>	1c, 2a-b, 3a-b, 4a-c, 5c	Mar 18-Oct 11
			<i>V. virginensis</i>	2a	Mar 30
		Papilionidae	<i>Papilio rutulus</i>	1a	May 30
		Pieridae	<i>Anthocharis cethura</i>	1a, 2a, 3a, 4a, 5a	Mar 29-Apr 11
			<i>Artogeia rapae</i>	3b	Apr 4-Aug 2
			<i>Colias eurytheme</i>	1a, 3c	Aug 2-Oct 11
			<i>Euchloe hyantis</i>	1a-b, 2a-b, 3a, 3c, 4a-b, 5a-c	Mar 29-Apr 11
			<i>Pontia protodice</i>	1a, 2a, 3a-c, 4a-c, 5a-b	Mar 15-Oct 17
		Psychidae	<i>Oiketicus</i> species	2b-c	Enclosed cocoons only
		Pterophoridae	<i>Oidaematophorus</i> species	2c, 4c	May 9-Oct 17
		Pyrilidae	<i>Achyra rantalis</i>	1a	Aug 6
			<i>Crambus</i> Species 1	5a	Sep 11
			<i>Crambus</i> Species 2	1a	Apr 16
			<i>Crambus</i> Species 3	1a	May 30-Jul 8
			<i>Crambus</i> Species 4	5a	Oct 22
			<i>Epheatia kuchniabla</i>	2c	Jun 13
			<i>Hymenia</i> species	3b	Oct 9
			<i>Loxostege ceralis</i>	1a, 4a	Sep 18-25
			<i>L. strictalis</i>	5a	Sep 11
			<i>Nomophila nearctica</i>	1a, 2c	May 18-Nov 8
			<i>Prorasea sideralis</i>	4a	Sep 18
		Riodinidae	<i>Apodemia mormo deserti</i>	4a-b	May 9
			<i>A. mormo</i> nr. <i>virgulti</i>	2a-b	May 2
			<i>A. palmeri</i>	1a, 5b	May 15-Jun 6, Sep 11-16
		Saturnidae	<i>Hemileuca burnsi</i>	1a-c, 4a	Sep 18-25
		Sphingidae	<i>Euproserpinus phaeton</i>	1a	Jan 29-Mar 18
			<i>Pachysphinx occidentalis</i>	1a	Aug 6
		Tineidae	<i>Acrolophus variabilis</i>	4a, 5a	Sep 11-18
			Species 1	1a, 5a	Sep 11-25

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Tortricidae	<i>Ofatulena duodecemstriata</i>	1a, 1c	Jul 8-Aug 6
			Species 1	2c	May 30
			Species 2	1a	Jun 13
			Species 3	2c	Apr 2
		Microlepidoptera	Species 1	5a	Oct 22
			Species 2	3b	Aug 2
			Species 3	5a	Oct 22
			Species 4	2c	Jun 13
			Species 5	5a	Oct 22
			Species 6	2c	Jun 13
			Species 7	3b	Nov 20
			Species 8	4c	May 9
			Species 9	1a	Aug 6
	Diptera	Agromyzidae	<i>Melanagromyza</i> sp.	5c	Jun 26
			Species 1	3b	Jun 6
		Apioceridae	<i>Apiocera acuticauda</i>	1a	Jul 8
			<i>A. pearcei</i>	5a	May 15-Jun 26
			<i>Rhaphiomidas acton</i>	4a	Jul 5
		Anthomyiidae	<i>Delia angustiventralis</i>	1a-b, 5a, 5c	Apr 11-16
			<i>D. platyura</i>	3a-b, 5c	Apr 4-18
			<i>Hylema cinerella</i>	1a, 2c	Apr 16-Jun 13
			<i>Pegomya duplicata</i>	1a	Apr 16-Jul 8
			<i>P. finita</i>	3b	Oct 9
			<i>Orthacheta</i> sp.	2b, 4a	May 2-9
		Anthomyzidae	<i>Anthomyza</i> sp.	3b	Jun 6
			Species 1	3b	Jun 6
		Asilidae	<i>Ablautus basini</i>	1a-b	Mar 18
			<i>A. californicus</i>	1a	Mar 18
			<i>Asilus californicus</i>	3b	Jun 6
			<i>A. occidentalis</i>	5a	May 15
			<i>Cerotainiops willcoxi</i>	1b	Jul 8
			<i>Cophura clausa</i>	5a	Apr 11
			<i>Efferia</i> near <i>antiochi</i>	1a-b	Sep 25
			<i>E. cana</i>	1a, 3b, 4c, 5a	May 9-Jun 13
			<i>E. candida</i>	1a, 5a	Jun 26-Aug 6
			<i>E. producta</i>	5b	May 2-Jun 26
			<i>Efferia</i> sp.	2a, 4b, 4c	May 9-Jun 13
			<i>Megaphorus frustrata</i>	2a-b	Jun 13-Sep 4
			<i>Proctacanthus nearno</i>	1a	May 30
			<i>Saropogon luteus</i>	1a-c, 2a, 3a-c, 4a-b, 5b	May 30-Aug 6
		Asteiidae	<i>Astiosoma aridum</i>	1a, 2a	May 2-30
		Bibionidae	<i>Bibio alpipennis</i>	1a, 5b	Apr 11-16
			<i>Dilophus tingi</i>	2c	Jun 13
		Bombyliidae	<i>Anthrax irroratus</i>	2b, 4c, 5b	Mar 29-Jun 26

Macro-Invertebrate	Order	Family	Species	Localities	Dates
			<i>Aphoebantus marcidus</i>	5a	Apr 11
			<i>A. mus</i>	3b	Jun 6
			<i>Aphoebantus</i> sp.	2b, 4a, 5a-b	May 9-Oct 17
			<i>Apolysis druias</i>	1a-c, 3b, 4a, 4c, 5a-c	Apr 11-Sep 25
			<i>Apolysis</i> sp. 1	4a-b	Sep 18
			<i>Apolysis</i> sp. 2	5a	Apr 11
			<i>Bombylius californica</i>	2b	Mar 29
			<i>Chrysanthrax pertusus</i>	2a, 4a	Jul 5-13
			<i>Conophorus fenestratus</i>	2a-b, 5b	Mar 29-Apr 11
			<i>Exepacmus</i> sp.	4a, 5a	Apr 9-11
			<i>Exoprosia sharonae</i>	5b	Sep 11
			<i>Geminaria canalis</i>	2a, 4a	May 2-9
			<i>Geron nigripes</i>	all localities	May 30-Nov 1
			<i>Hemipenthes eumenes</i> group	1a, 4a, 5a-b	Apr 9-16
			<i>Heterostylum robustum</i>	3b, 4a	May 9-Aug 2
			<i>Lepidanthrax inauratus</i>	2a-b, 5a-b	May 15-Sep 4
			<i>Lordotus cingulatus</i>	3c, 5a	Sep 11-Oct 9
			<i>L. luteolus</i>	1a, 4a, 5a	Apr 9-Sep 25
			<i>L. striatus</i>	2b-c, 3a	Oct 9-17
			<i>Lordotus</i> sp.	1a	Aug 6
			<i>Mythicomylia antecessor</i>	1a-b, 4a, 5c	Jun 26-Sep 25
			<i>M. armata</i>	5b-c	Apr 11-Oct 22
			<i>M. californica</i>		
			<i>Neodiplocampta</i> sp.	3b	Aug 2
			<i>Oligodranes trochilus</i>	1a, 2a-c, 4a-c, 5a-b	Mar 29-Nov 1
			<i>Pantarbes erinos</i>	5a	May 15
			<i>Paravilla californica</i>	4c	May 9
			<i>P. mercedis</i>	2a-b	Jun 13
			<i>P. syrtis</i>	2a-b, 4a, 4c	May 2-Sep 18
			<i>Poecilanthrax californicus</i>	2a, 2c, 3a, 3c	Oct 9-17
			<i>P. willistoni</i>	2b, 3a-c, 5a	Oct 3-22
			<i>Toxophora virgata</i>	1a, 3b, 3c	Jun 6-Jul 11
			<i>Villa agrippina</i>	1a-b, 2a, 3a-c, 4c, 5a, 5c	May 2-Oct 9
			<i>Villa andrewsi</i>	4c	Apr 9
			<i>V. arenosa</i>	2a	Jun 13
			<i>V. caprea</i>	1a-b	Sep 25
			<i>V. lateralis</i>	4a, 5a-c	May 9-Sep 11
			<i>V. pallida</i>	1c, 2a	May 2-30
			<i>Villa</i> species	1a	Sep 25
		Calliphoridae	<i>Bufolucilia silvarum</i>	3b	Jul 11
			<i>Calliphora terrae-novae</i>	3a, 5b	Apr 11-18
			<i>Pollenia rudis</i>	3b	Apr 18
			Species 1	3b	Jun 6



Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 2	3b	Jul 11
		Ceratopoginidae	<i>Culicoides</i> near <i>copiosus</i>	3a	Apr 4-Jun 6
			<i>Dasynelea</i> sp.	3a	Apr 4
			<i>Forcipomyia brevipennis</i>	5c	Apr 11
			<i>Leptoconops</i> sp. 1	3b-c	Apr 4-Jun 6
			<i>Leptoconops</i> sp. 2	2b	Mar 29
			<i>Rhynchohelea</i> sp.	3b	Jun 6
		Chaemyiidae	<i>Leucopis</i> sp. 1		
			<i>Leucopis</i> sp. 2		
			<i>Leucopis</i> sp. 3		
			<i>Leucopis</i> sp. 4		
			<i>Leucopis</i> sp. 5		
		Chloropidae	<i>Biorbitella hesperia</i>	3a	Apr 18-Jun 6
			<i>Diptoxa unicolor</i>	3a	Jul 11
			<i>Hippelates</i> sp.	1a, 2a, 3a-c, 4a, 4c, 5c	Apr 4-Oct 22
			<i>Oicella punctifrons</i>	1a, 3a	May 30-Jun 6
			<i>Oicella</i> sp.	1a, 4a-c	May 9-Jul 8
			<i>Siphonella</i> sp.	1c, 2c, 3a-b, 5c	Apr 4-Oct 22
			<i>Thaumstomya rubida</i>	1a, 1c	May 30
			Species 1	2a, 3a-b, 5a-b	May 2-Oct 22
			Species 2	1c, 3c	Apr 4-May 30
			Species 3	3b	Apr 4
		Cecidomyiidae	<i>Asphondylia</i> sp. 1	2c, 4a, 5a	Jun 13-Sep 18
			<i>Asphondylia</i> sp. 2	1a, 2c	Apr 16-Oct 17
			Species 1	1c, 3c	Apr 4-Jul 8
		Chironomidae	Species 1	1a, 2c, 3b	May 30-Jun 13
			Species 2	1a, 3a-c	Apr 4-Jun 6
			Species 3	1a, 3a-b	Apr 18-Jun 6
			Species 4	1a	Apr 16
			Species 5	2c, 3b	Apr 18-Jun 13
			Species 6	1a, 3a-b	Mar 18-Jun 6
			Species 7	1a, 3a-b	Apr 16-Jun 6
			Species 8	3a-b	Jun 6
		Chyromidae	<i>Gymnochiromyia</i> sp.	1a	Apr 16
		Conopidae	<i>Physocephala texana</i>	3a-b	Jun 6-Oct 3
			<i>Thecophora propinqua</i>	1a	Jul 8
			<i>Zodion fulvifrons</i>	1a, 2a, 5a	May 2-Oct 22
		Culicidae	<i>Aedes varipalpus</i>	5a	Sep 11
			<i>Culiseta inornata</i>	3b	Jun 6
			<i>Culex peus</i>	3b	Jun 6
		Dolichopodidae	<i>Dolichopus consanguineus</i>	3a-b	Apr 18-Oct 9
			<i>Dolichopus</i> sp.	3b	Oct 9
			<i>Hydrophorus eldoradensis</i>	1a, 3b, 5c	Apr 4-May 30
			<i>H. innotatus</i>	2c, 3a-b	Apr 4-Oct 17

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Medetera</i> sp.	1a, 3b	Apr 16-Jun 6
		Empidae	<i>Drapetis</i> sp.	1a	Sep 25
			<i>Platypalpus</i> sp.	3a	Apr 4
		Ephydriidae	<i>Ephydra halophila</i>	2c, 3a-b, 4a	Apr 4-Oct 17
			<i>Mosillus tibialis</i>	1a-b, 2b, 3a-c, 5c	Apr 4-Aug 6
			<i>Parydra</i> sp.	3a-b	Apr 4-18
			<i>Psilopa olga</i>	3a	Apr 4-Jul 11
			<i>Ptilomyia pleuriseta</i>	3a-b	Apr 18-Jul 11
			<i>Scatella paludum</i>	3a-c	Apr 4-Jun 6
			<i>Scatella stagnalis</i>	3a	Apr 18
			Species 1	3b	Jul 11
			Species 2	1a	Mar 18
			Species 3	2c	Jun 13-Sep 4
		Heleomyzidae	<i>Pseudoleria</i> sp.	1a, 2c	Apr 2-16
		Milichiidae	<i>Hemeromyia</i> sp.	3b	Apr 18
			<i>Leptometopa latipes</i>	1b-c, 5c	Apr 16-May 30
			<i>Milichiella</i> sp.	2b, 3b, 5b	Mar 29-Jun 6
			<i>Milichiella</i> sp.	1c, 2a, 3a-c, 4a-b, 5a-c	Mar 29-Oct 22
		Muscidae	<i>Lispe</i> sp.	1a, 2c, 3a-b	Apr 2-Oct 9
			<i>Limnophora narona</i>	3b	Aug 2
			Species 1	5c	May 15
			Species 2	1a	Jul 8
			Species 3	3b	Apr 18
			Species 4	3a-b	Apr 4-18
			Species 5	1c, 2a	Jul 8-Oct 17
			Species 6	3a, 3c, 5b-c	Apr 18-Oct 22
			Species 7	3a-b, 5a, 5c	Apr 4-Oct 22
			Species 8	3b	Apr 18
		Mycetophilidae	<i>Docosia</i> sp.	5c	Apr 11
		Otitidae	<i>Euxesta</i> sp. 1	3b	Aug 2
			<i>Euxesta</i> sp. 2	3a-b	Apr 4
			<i>Euxesta</i> sp. 3	3b	Aug 2
			<i>Euxesta</i> sp. 4	5c	Apr 11
			<i>Meliera similis</i>	3b	Jul 11-Oct 9
			<i>Physiphora demandata</i>	1a, 5a	Jul 8-Sep 11
		Sarcophagidae	<i>Blaesoxiphra plinthopyga</i>	1b, 2a-b, 3c, 4b-c, 5a-b	May 15-Oct 17
			<i>B. omani</i>	1a, 4a, 5a-b	May 9-Sep 11
			<i>Eumachronychia persolla</i>	3c, 5b	Jun 6-26
			<i>Senotainia flvicornis</i>	3b	Aug 2
			Species 1	3b, 4a	May 9-Aug 2
			Species 2	1a	Jul 8
		Scatopsidae	<i>Coboldia fuscipes</i>	3a-b	Apr 4-Aug 2
			Species 1	3b	Jun 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Scenopinidae	<i>Belosta</i> sp.	5a	Apr 11
			<i>Metatrichia bulbosa</i>	1a, 2a, 3b-c, 4a-b, 5b	May 9-Sep 18
		Sphaeroceridae	<i>Copromyza equina</i>	2c	Jun 13
			<i>Leptocera limosa</i>	2c, 3a-b	Apr 4-Jul 11
		Sciomyzidae	<i>Pherbella vitalis</i>	3b	Oct 9
		Sepsidae	<i>Sepsis neocynipsea</i>	3b	Jul 11
		Simuliidae	<i>Simulium vittatum</i>	3b	Apr 4
		Stratiomidae	<i>Dieuryneura stigma</i>	1a	Jul 8
			<i>Nemotelus arator</i>	3b	Apr 4-Aug 2
			<i>Odontomyia alticola</i>	1a	Sep 25
			<i>O. arcuata</i>	1a, 3b	Sep 25-Oct 9
		Syrphidae	<i>Allograpta exotica</i>	3b, 4a	Sep 18-Oct 9
			<i>Ceriana</i> sp.	1a, 3b	May 30-Aug 2
			<i>Eristalis latifrons</i>	1a, 3b, 4b, 5a	Apr 16-Nov 8
			<i>E. tenax</i>	1a	Apr 16
			<i>Eupeodes volucris</i>	5c	Apr 11
			<i>Helophilus bilineatis</i>	3b	Apr 4
			<i>Mesograpta marginata</i>	5a	Oct 22
			<i>Platycheirus stegnus</i>	3c, 5b	Apr 4-11
			<i>Syritta pipiens</i>	3b	Jul 11
		Tabanidae	<i>Chrysopa discalis</i>	3a-b	Apr 4-Oct 9
			<i>Silvius abdominalis</i>	3b	Jun 6
			<i>Tabanus punctifer</i>	3b	Jun 6-Jul 11
		Tachinidae	<i>Angiorhina robusta</i>	3b	Jun 6
			<i>Cylindromyia armata</i>	4b	May 9
			<i>Deopalpus contiguus</i>	4b	Apr 9
			<i>Euphasiopteryx ochracea</i>	1a	Aug 6-Sep 25
			<i>Gymnosoma fuliginosum</i>	1a, 2a-b, 3c, 4a, 5b	Mar 18-May 9
			<i>Micrachaetina</i> sp.	4c	May 9
			<i>Paradidyma</i> sp.	1a, 2a, 3c	Apr 4-Jul 8
			<i>Peleteria malleola</i>	1a, 3c, 5a	Apr 4-16
			<i>Phasia aldrichii</i>	2b, 4a, 5a-c	Mar 29-Oct 22
			<i>Phasia</i> sp.	4a	Apr 9
			<i>Trichopoda pennipes</i>	2a	Jun 13
			Species 1	3c	Jun 6
			Species 2	1a, 2c	June 13-Jul 8
			Species 3	1a	Jul 8
		Tenthinidae	<i>Pelomyia</i> sp.	3b	Apr 4-18
			<i>Pelomyiella</i> sp.	1a, 3b-c	Apr 4-18
		Tephritidae	<i>Dioxyna picciola</i>	4a	Sep 18
			<i>Euarestoides acutangulus</i>	1a, 2b-c, 3c, 4a, 5b-c	Mar 29-May 9
			<i>Neaspilota brunneostigmata</i>	1b, 3c, 4a	May 9-Sep 24
			<i>Paroxyma murina</i>	4a	May 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Prececidochares minuta</i>	5a	Apr 11
			<i>Trupanea jonesi</i>	5a-b	Apr 11
		Therevidae	<i>Pherocera mojavnensis</i>	1b, 2a, 3c	May 30-Jun 13
			<i>Thereva</i> sp. 1	1b	Apr 16
			<i>Thereva</i> sp. 2	1b, 5a, 5c	Apr 11-16
			<i>Thereva</i> sp. 3	1a-b, 5c	Apr 11-Aug 6
		Tipulidae	<i>Dactylobis vestigipennis</i>	2c	Jan 29
			<i>Limnophila</i> sp.	3b	Jun 6
			<i>Tipula</i> sp. 1	1b	Apr 16
			<i>Tipula</i> sp. 2	2c	Apr 2
		Trioxscelididae	<i>Trioxscelis frontalis</i>	1a, 1c, 3b-c, 4a, 4c, 5a-c	Apr 4-Jun 6
	Hymenoptera	Andrenidae	<i>Andrena astragali</i>	1a, 3b, 4a, 5b	Mar 18-May 9
			<i>Andrena auricoma</i>	1a, 5b	May 30-Sep 11
			<i>Andrena bipunctata</i>	5b	Oct 22
			<i>Andrena cleodora</i>	1d, 4a	Apr 9-18
			<i>Andrena dissimulus</i>	4a	Apr 9
			<i>Andrena levipes</i>	2b	Mar 29
			<i>Andrena prunorum</i>	1a, 4a-b	Apr 9-May 9
			<i>Andrena subchalybea</i>	1a	Apr 16
			<i>Andrena submoesta</i>	2b, 3c, 4a	Mar 29-Apr 9
			<i>Andrena</i> species	2b	May 2
			<i>Nomadopsis puellae</i>	1a	Apr 16
			<i>Nomadopsis scutellaris</i>	3b	Jun 6-Oct 3
			<i>Perdita claypolei</i>	1a	Apr 16
			<i>Perdita intersecta</i>	1a-b, 2a, 3a-b, 4c, 5a	May 2-Oct 22
			<i>Perdita nigrella</i>	1a, 3a, 5a	Apr 11-Jun 6
			<i>Perdita</i> species	1a, 1c	May 30
			Species 1	4b	Apr 9
			Species 2	4a, 5a	Apr 9-11
		Anthophoridae	<i>Anthophora californica</i>	2a, 3a-b	Jun 6-13
			<i>Anthophora cockerelli</i>	1a, 5a	Jun 26-Sep 25
			<i>Anthophora flavocincta</i>	3a-c	Jun 6-Aug 2
			<i>Anthophora hololeuca</i>	5b-c	Sep 11
			<i>Anthophora porterae</i>	5a	Apr 11
			<i>Centris hoffmanseggiae</i>	2a, 4b-c, 5a	Apr 9-May 15
			<i>Diadasia australis</i>	2a, 3b-c	Jun 6-Aug 2
			<i>Diadasia enavata</i>	1a, 2a	Jun 13-Sep 25
			<i>Diadasia laticauda</i>	1a, 3a-b	Jul 11-Sep 25
			<i>Melissodes tessellata</i>	1a, 3a-c	Jun 6-Oct 9
			<i>Melissodes</i> Species 1	2b, 3a-c	May 2-Oct 9
			<i>Melissodes</i> Species 2	1a-b, 2c, 3b	Aug 2-Oct 17
			<i>Nomada</i> ( <i>Nomada</i> ) species	4b	Apr 9
			<i>N. (Holonomada)</i> species	4a	Apr 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Ptilothrix near bombiformis</i>	2c	Oct 17
			<i>Tetralonia primiveris</i>	4a, 5b	Apr 9-11
			<i>Triepeolus</i> species	1b, 2a, 5a-b	May 2-Oct 22
			<i>Xeromelecta californica</i>	5a	Oct 22
			Species 1	5b-c	Sep 11
			Species 2	3c	Jun 6
			Species 3	5b	Apr 11
		Apidae	<i>Apis mellifera</i>	1a, 2a-b, 5a-b	Mar 29-Nov 8
			<i>Bombus crotchii</i>	2c	Jun 13
		Bethylidae	<i>Epyris</i> species	1a, 3b, 5a	Jul 8-Sep 11
			Species 1	2a	May 2
		Braconidae	<i>Agathis</i> Species 1	3b, 4c, 5b-c	Apr 4-May 9
			<i>Agathis</i> Species 2	1c	Jul 8
			<i>Agathis</i> Species 3	1c, 3c, 5a	Apr 11-Oct 9
			<i>Agathis</i> Species 4	5b	Apr 11
			<i>Apanteles</i> Species 1	1c, 2a, 4b, 5a, 5c	Apr 11-Oct 22
			<i>Apanteles</i> Species 2	5a	Apr 11
			<i>Bracon</i> Species 1	1c, 5b-c	Apr 11-May 30
			<i>Bracon</i> Species 2	1a, 1c, 2c, 5a, 5c	Apr 11-Sep 4
			<i>Bracon</i> Species 3	1b	Jul 8
			<i>Bracon</i> Species 4	1a-b, 2c	Apr 11-Jul 8
			<i>Bracon</i> Species 5	2a	May 2
			<i>Bracon</i> Species 6	5c	Jun 26
			<i>Chelonus</i> species	5a	Apr 11
			Cheloninae species	1c	May 30
			<i>Microgaster</i> species	2c	Oct 17
			<i>Microplitis</i> species	5c	Apr 11
			Species 1	5a-c	Apr 11
			Species 2	5c	May 15
			Species 3	4c	May 9
			Species 4	4a	May 9
		Ceraphronidae	<i>Dendrocerus</i> species	4a	Sep 18
			Species 1	1b	May 30-Jul 8
			Species 2	3c	Apr 4
			Species 3	4a	Sep 18
			Species 4	2a	Jun 13
		Chalcididae	<i>Haltichella</i> species	1a, 2a, 3a, 5b	Mar 18-Jun 26
			<i>Hockeria</i> species	5b	Sep 11
			Species 1	5c	Apr 11
			Species 2	3b	Jul 11
			Species 3	1c	May 30
			Species 4	5b	May 15
		Chrysididae	<i>Chrysis australis</i>	3a	Jun 6
			<i>Chrysis fuscipennis</i>	3b	Jul 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Hedychrum boharti</i>	5b	May 15
			<i>Parnopes edwardsii</i>	3a-b	Jun 6-Oct 3
			<i>Pseudolopyga taylori</i>	1b	Sep 25
		Colletidae	<i>Colletes clypeonitens</i>	1a, 1c, 2c, 5a-b	May 15-Oct 22
			<i>Colletes louisae</i>	2b	May 2
			<i>Colletes</i> Species 1	2c, 5a-b	May 15-Oct 22
			<i>Colletes</i> Species 2	4a	May 9
			<i>Colletes</i> Species 3	1a	May 30
			<i>Colletes</i> Species 4	1a-b, 5a, 5c	Sep 11-25
			<i>Colletes</i> Species 5	1a	Sep 25
			<i>Colletes</i> Species 6	1a-b, 2c, 5a-b	Sep 11-Oct 17
			<i>Colletes</i> Species 7	1a, 1c, 2a, 4a-b, 5b	Apr 9-May 30
			<i>Hylaeus episcopalis</i>	5b	May 15
			<i>Hylaeus mesillae</i>	2b, 3b	Jun 6-Jul 11
		Cynipidae	Species 1	5a	Apr 11
			Species 2	3b	Apr 4
		Encyrtidae	Species 1	1a, 1c, 2a, 5a-c	Mar 18-Oct 22
			Species 2	1a, 2b, 4a	Aug 6-Nov 1
			Species 3	2a	Oct 17
			Species 4	1c, 4b, 5b-c	May 9-Oct 22
		Eulophidae	<i>Aprostocetus</i> Species 1	2b, 4b	Jun 13-Oct 17
			<i>Aprostocetus</i> Species 2	2a, 2c, 3b, 4a, 4c, 5a-b	Apr 11-Oct 17
			<i>Cirrospilus</i> species	3a	Oct 9
			<i>Diglyphusia</i> species	3a	Jul 11
			Eulophinae species	1a	Mar 18
			Entedoninae Species 1	1a	Jul 8
			Entedoninae Species 2	5a	Apr 11
			<i>Eprhopalotus</i> species	1a, 5b	Mar 18-Oct 22
			<i>Sympiesis</i> species	3c	Apr 4
			<i>Zagrammosoma</i> species	1c	May 30
		Eupelmidae	Species 1	4c	May 9
			Species 2	1b	Sep 25
		Eurytomidae	<i>Eurytoma</i> complex	1a-b, 2a, 2c, 4c, 5a-c	Apr 11-Oct 22
			Non <i>Eurytoma</i> complex	5a	Apr 11
			<i>Rileyia cecidomyiae</i>	1b, 3b 5b	Apr 4-Sep 25
			<i>Rileyia hegeli</i>	4a	Sep 18
			<i>Rileyia mellea</i>	5b	Apr 11
			<i>Rileyia tequilaris</i>	2a, 5a-b	Apr 11-Oct 22
		Formicidae	<i>Camponotus semitestaceus</i>	5a	May 15
			<i>Crematogaster mormonum</i>	1b	Nov 8
			<i>Dorymyrmex bicolor</i>	1a, 1c	Mar 18-Aug 6
			<i>Dorymyrmex pyramicus</i>	1a	Nov 8
			<i>Formica pilicornis</i>	1a, 3b, 5c	Apr 4-Oct 22

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Formica perpilosa</i>	3b	Apr 4-Oct 3
			<i>Myrmecocystus creightoni</i>	5a-b	Apr 11
			<i>Myrmecocystus mexicanus</i>	4a	Sep 18-Nov 1
			<i>Myrmecocystus mimicus</i>	1a-c, 2b, 4a, 4c, 5a	Mar 18-Nov 8
			<i>Lasius neoniger</i>	1a, 3b, 5a	Apr 4-May 30
			<i>Liometopum occidentale</i>	1a, 3b	Jul 11-Nov 8
			<i>Messor pergandei</i>	2a-c, 3c, 4a-c, 5a	all year
			<i>Pheidole barbata</i>	1c, 4c	Nov 1-8
			<i>Pheidole desertorum</i>	2c, 3a, 5c	Apr 18-Oct 17
			<i>Pogonomyrmex californicus</i>	1a-b, 3b, 4a, 4c, 5a	Mar 18-Jun 26
			<i>Pogonomyrmex rugosus</i>	1c-d, 2a-c, 3a-c, 5c	Mar 29-Nov 8
			<i>Solenopsis xyloni</i>	1a-b, 2a, 3a-b, 4c, 5b	Mar 18-Oct 22
		Halictidae	<i>Agapostemon melliventris</i>	1a, 3b	Jul 11-Nov 8
			<i>Agapostemon texanus</i>	1a	Apr 16
			<i>Augochlora</i> species	3b	Apr 4
			<i>Dialictus</i> species	1a-b, 2a, 3a-b, 4a-b, 5a-b	Mar 18-Oct 22
			<i>Dufourea mulleri</i>	3a, 5b	Apr 11-18
			<i>Lasioglossum sisymbrii</i>	1a, 4c	Apr 9-16
			Species 1	3b, 4a	Apr 9-Jul 11
		Ichneumonidae	<i>Anomalon</i> species	1c	Jul 8
			<i>Charops</i> species	1c	Apr 16-Jul 8
			<i>Compsocryptus</i> species	5b	Apr 11
			<i>Cremastus</i> species	5a	Oct 22
			<i>Eridolius</i> species	5c	Apr 11
			<i>Erigorgus</i> species	5b	Apr 11
			<i>Netelia</i> Species 1	1a	Apr 16
			<i>Netelia</i> Species 2	3b	Oct 9
			<i>Ophion</i> species	1a	Apr 16
			<i>Pterocormus inurbanus</i> gp	3b	Apr 18
			Species 1	5c	Apr 11
			Species 2	5c	May 15
		Megachilidae	<i>Anthidium cockerelli</i>	1a, 2a	May 2-30
			<i>Anthidium mormonum</i>	2a	May 2
			<i>Ashmeadiella aridula</i>	1b, 2a, 3b, 5b	May 2-Jul 11
			<i>Chalicodoma spinotulata</i>	1a, 2a-b, 5b	May 15-Sep 4
			<i>Coelioxys</i> species	1a	Sep 25
			<i>Dianthidium</i> species	1a, 5b	May 15-30
			<i>Dioxys pomonae</i>	5a, 5c	Apr 11
			<i>Dolichostelis perpulchra</i>	1a	Jul 8
			<i>Megachile brevis</i>	1a, 3a-b, 5b	Apr 16-Aug 2
			<i>Megachile concinna</i>	1a	Aug 6
			<i>Megachile discorhina</i>	1a, 4a, 5b	May 9-Aug 6
			<i>Megachile nevadensis</i>	1a, 2a, 3b	Jun 13-Oct 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Osmia clarescens</i>	4a, 5a	Apr 9-11
			<i>Osmia titus</i>	5a	Apr 11
			<i>Stellis</i> species	5b	May 15
			Species 1	3c	Jun 6
		Mutillidae	<i>Chyphotes melaniceps</i>	1a, 2c, 5a	Jun 13-Oct 17
			<i>Chyphotes mickeli</i>	2c, 3b	Apr 2-Sep 4
			<i>Chyphotes nubeculus</i>	3b, 4a, 5a	Sep 11-Oct 9
			<i>Dasymutilla californica</i>	3b-c	Jun 6
			<i>Dasymutilla</i> species	3b	Jun 6-Oct 9
			<i>Sphaerophthalma</i> Species 1	2a, 2c	Jun 13
			<i>Sphaerophthalma</i> Species 2	3b	Jun 6
			<i>Sphaerophthalma</i> Species 3	2c	Oct 17
			<i>Sphaerophthalma</i> Species 4	3b	Oct 9
			<i>Sphaerophthalma</i> Species 5	1a, 2c, 3b, 4a, 4c	May 9-Oct 17
		Ormyridae	Species 1	4a	May 9
			Species 2	1c	May 30
		Perilampidae	Species 1	1c, 3b	May 30-Jul 11
			Species 2	2a, 5a	Apr 11-Oct 22
		Platygasteridae	Species 1	1b, 2a, 2c, 5a-c	Apr 11-Oct 22
		Pompilidae	<i>Ageniella blaisdelli</i>	1c, 3b	Jul 8-11
			<i>Anoplius deora</i>	1b, 3b	May 3-Oct 3
			<i>Anoplius dreisbachi</i>	3b	Apr 18
			<i>Anoplius imbellis</i>	1a-c, 3b-c, 4c, 5a-c	Apr 18-Aug 2
			<i>Anoplius tenebrosus</i>	3c	Jul 11
			<i>Anoplius toluca</i>	3b	Jul 11
			<i>Aporinellus yucatanensis</i>	1a, 5b	May 15-Oct 22
			<i>Aporus hirsutus</i>	1c	May 30
			<i>Pepsis chrysothemia</i>	1a, 2a, 3b-c, 4b-c, 5b	Apr 9-Jul 11
		Proctotrupidae	Species 1	1a, 2c	Jun 13-Jul 8
		Pteromalidae	<i>Scutellista</i> species	1b, 3b	Jul 11-Sep 25
			Species 1	1a, 1c, 3b, 4a, 5a-c	Mar 18-Oct 22
			Species 2	1a-b, 2a, 3b-c, 4b	Apr 4-Jul 11
			Species 3	1b-c, 3a-b, 5a, 5c	Apr 11-Oct 22
			Species 4	1c, 2b	Mar 29-30
			Species 5	4b, 5a	Apr 11-May 9
			Species 6	5a	Apr 11
			Species 7	3c	Apr 4
			Species 8	4b	May 9
			Species 9	4b	May 9
		Scelionidae	Species 1	1c, 2a, 2c, 3a, 3c, 5c	May 2-Sep 11
		Sphecidae	<i>Ammophila aberti</i>	1a, 2a, 3a	Jun 6-Jul 11
			<i>Ammophila pruinosa</i>	1a, 3b, 4a, 4c, 5a-b	May 9-Oct 22
			<i>Ammophila</i> Species 1	5b	Oct 22



Macro-invertebrate	Order	Family	Species	Localities	Dates
			<i>Ammophila</i> Species 2	4a	Apr 9
			<i>Bembix americana</i>	1a, 3b	Jun 6-Aug 6
			<i>Cerceris californica</i>	2a, 5b	May 15-Jun 13
			<i>Cerceris convergens</i>	1a	Jul 8
			<i>Cerceris sextoides</i>	3b	Aug 2
			<i>Cerceris</i> species	4a	Jul 5
			<i>Chalybion californicum</i>	3b	Jul 11
			<i>Clypeadon lacticinctus</i>	3c	Oct 9
			<i>Diodontus</i> species	5b	Apr 11
			<i>Dryudella aspersa</i>	1a, 5a	Apr 11-16
			<i>Fernaldina lucae</i>	2a	Jun 13
			<i>Foxia navajo</i>	1a-b	Jul 8-Aug 6
			<i>Glenosticta argentata</i>	3b	Aug 2
			<i>Glenosticta scitula</i>	1a	May 30
			<i>Larropsis tenuicornis</i>	1a, 4b	May 9-30
			<i>Liris</i> species	3b	Jul 11
			<i>Microbembix argyropleura</i>	1a-b, 5a	May 15-Aug 6
			<i>Oxybelus argenteopilosus</i>	3a-b	Jun 6-Aug 2
			<i>Oxybelus</i> species	1a-b	Sep 25
			<i>Palmodes californica</i>	4a	May 9
			<i>Palmodes</i> species	1a, 1c, 3a-c	May 30-Aug 6
			<i>Podalonia deserticola</i>	1a, 2b, 3a, 3c, 4b, 5a-b	Apr 4-Nov 8
			<i>Podalonia luctuosa</i>	2b, 3a, 3c, 5b-c	Mar 29-May 15
			<i>Prionyx foxi</i>	1a, 2a-b, 4a, 5a	Jun 13-Jul 8
			<i>Prionyx parkeri</i>	1a-b, 2a-b, 3a, 3c, 5a-b	May 2-Sep 25
			<i>Philanthus levini</i>	1a, 3b	Jul 8-Oct 9
			<i>Philanthus multimaculatus</i>	1a, 3b	Jul 8-Oct 9
			<i>Philanthus ventilabris</i>	1a, 3b	Aug 2-Oct 9
			<i>Sceliphron caementarium</i>	1a, 3b	May 30-Aug 6
			<i>Sphecius convallis</i>	3b	Jul 11-Aug 2
			<i>Sphex ashmeadi</i>	1a, 5b	Aug 6-Sep 11
			<i>Sphex ichneumoneus</i>	3b	Jul 11-Aug 2
			<i>Steniolia duplicata</i>	1a, 2a-b, 3a-c, 5a-c	May 15-Oct 22
			<i>Tachysphex ashmeadii</i>	1a-b, 3c, 5b	May 30-Aug 6
			<i>Tachysphex coquilletti</i>	1a-b, 2a, 3b, 4b, 5b	May 2-Jul 11
			<i>Tachysphex texanus</i>	1a, 2a, 5b	May 15-Sep 4
			<i>Tachytes erimineus</i>	1a, 2a, 4a	Jun 13-Aug 6
			<i>Trypoxylon californicum</i>	3b	Jun 6
			Species 1	1a, 3a-c	Jun 6-Jul 11
			Species 2	1a, 3b-c	Jun 6-Jul11
			Species 3	5b	May 15
			Species 4	5b	Jun 26
		Scoliidae	<i>Campsomeris plumipes</i>	1a, 3b	Jul 8-Aug 6
			<i>Scolia</i> species	1a, 3b	Jul 8-Aug 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Tiphiidae	<i>Brachycistis carinata</i>	1a, 3b, 4c, 5a	May 9-Sep 11
			<i>Brachycistis ioachinensis</i>	2c, 3b	Apr 2-Oct 17
			<i>Brachycistis inaequalis</i>	1a, 2c, 3b, 4c	Apr 2-Oct 17
			<i>Brachycistis lacustris</i>	1a, 3b, 4c, 5a	Apr 16-Sep 11
			<i>Brachycistis triangularis</i>	4a	Sep 18
			<i>Brachycistis</i> Species 1	4a, 4c, 5a	May 9-Sep18
			<i>Brachycistis</i> Species 2	1a, 2c	Jun 13-Sep 4
		Torymidae	Species 1	2a	Oct 17
			Species 2	5c	Apr 11
			Species 3	5b	Oct 22
			Species 4	1a	May 30
			Species 5	1a	Mar 18
			Species 6	2a	Jun 13
		Vespidae	<i>Ancistrocerus adiabatus</i>	5a	Oct 22
			<i>Ancistrocerus crucifera</i>	3b	Jul 11-Aug 2
			<i>Euodynerus annulatus</i>	1a, 1c, 4a	Jul 5-Aug 6
			<i>Euodynerus exoglyphus</i>	1c, 3a-b, 5b	Jun 6-Aug 2
			<i>Euodynerus nidalgo</i>	1a, 3a	Jul 8-11
			<i>Leptochilus electus</i>	2a	May 2
			<i>Leptochilus</i> species	2b, 5b	May 15-Sep 4
			<i>Parancistrocersu mcclayi</i>	1a, 3b	Jun 6-Sep 25
			<i>Polistes fuscatus</i>	3a-c	Apr 4-Oct 9
			<i>Pterocheilus trachysomus</i>	5b	Jun 26
			<i>Pterocheilus</i> species	2a	Jun 13
			<i>Vespula pensylvanica</i>	1a	Nov 8
			Species 1	5a	Jun 26

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<b>13. ABSTRACT (Maximum 200 words)</b>  An invertebrate survey was performed on Edwards Air Force Base during the 1996 season (April through October). Survey methods involved sweeping of blooming and nonblooming vegetation, searching for invertebrates beneath rocks, logs, and other objects, searching for diurnal and nocturnal crawling, flying, and calling invertebrates, and collecting nocturnal invertebrates drawn to a mercury vapor light. From this study, 974 species were collected. Of these species, approximately 98 percent were insects and over 95 percent belonged to the eight major insect orders: Coleoptera, Lepidoptera, Diptera, Hymenoptera, Orthoptera, Homoptera, Hemiptera, and Neuroptera. One very rare Chrysopid, <i>Pimachrysa albicostales</i> , and a new species of Scarabaeid, in the genus of <i>Serica</i> , were collected by this study. Only two specimens of the <i>Pimachrysa</i> were previously known. Considering that less than 20 percent of the invertebrates have been identified by experts, it is quite probable that there are other undescribed species found at Edwards Air Force Base.				
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